THE

MARINERS

NEW

Kalendar.

Containing

The Principles of Arithmetick and Geometry; with the Extraction of the Square and Cube Root. Alſo Rules for finding the Prime, Epact, Moon's Age, Time of High-Water, with Tables for the ſame.

Together with

Exact Tables of the Sun's Place, Declination, and Right Aſcenſion. Of the Right Aſcenſion and Declination of the Principal Fixed Stars. Of the Latitude and Longitude of Places. A large Table of Difference of Latitude and Departure, for the exact Working a Traverſe.

ALSO

The Deſcription and Uſe of the Sea-Quadrant, Foreſtaff and Nocturnal. The Problems of Plain Sailing and Aſtronomy, wrought by the Logarithms, and by *Gunter*'s Scale. A Rutter for the Coaſts of *England*, *Scotland*, *Ireland*, *France*, &c. And the Soundings coming into the Channel. With Directions for Sailing into ſome Principal Harbors.

By NATH. COLSON, *Student in the Mathematicks.*

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This is a better Edition than the Last Edit.n Lond.n 1759 more correct & bett.r paper

TO THE

Ingenious Mariner.

I Here preſent thee with a NEW KALENDAR, *wherein I have endeavoured not to puzzle thee with unprofitable Problems (a thing too much practiſed) but to make things plain and practicable. Here's nothing obſcure or difficult, to diſcourage young Beginners, (for whom 'tis intended;) but all things treated of with as much plainneſs, both of Matter and Method, as poſſible: and I aſſure thee, were I preſent to inſtruct thee, I could by no means render things more intelligible than I have here done. I have endeavoured to omit nothing that might be materially uſeful, having reſpect to the deſigned bigneſs of the Volume. The Contents are as follow.*

The Principles of Arithmetick, with which I begin, becauſe I am ſenſible of the loſs ſome have been at, that have attempted Navigation before they have underſtood ſomething of it; The Extraction of the Square and Cube Root, in all which I have endeavoured to apply the Examples to Sea-Affairs. Some neceſſary Geometrical Problems, uſeful in Navigation. Directions for finding the Prime, Epact, Moon's-Age, and the time of Full-Sea, (both according to the ordinary, and a more accurate way) with Tables for the ſame.

Talbes of the Sun's Place and Declination, with Directions and Examples of every caſe how to uſe the Declination to find the Latitude: As alſo the neceſſary Tables for correcting the Declination, when the Difference of Longitude is conſiderable from the Meridian of London, *for which the ſaid Tables of Declination are calculated. A Table of the Sun's Right Aſcenſion. A Table of the Right Aſcenſion and Declination of ſome of the principal Fixed Stars:*

with the use of the said Tables in finding the time of a Star's coming to the Meridian; as also Directions at large for Observation of any of the said Stars to find the Latitude of the Place, with Examples in each Case. The Description and Use of the Sea-Quadrant, Fore-staff, and Nocturnal. A Table of Latitude and Longitude of the principal Places on the Sea-Coast, collected from the best Informations. Problems of Plain-Sailing and Astronomy, which (that the Practitioner might learn two Things at once) are wrought both by the Logarithms, and Gunter's *Scale. A large and very useful Table of Difference of Latitude and Departure, to every Degree and Quarter-Point of the Compass: With its Use in working a Traverse, in order to keep a Reckoning at Sea. A Rutter for the Coast of* England, Scotland, France, Ireland, Spain, Portugal, &c. *shewing the Bearing and Distance from one place to another. A Table of the Soundings coming into the Channel, giving the Depth of Water, and Quality of the Ground. Lastly, Directions for sailing into some principal Harbours. By all, or any of which, if thou art any ways profited (as I know thou mayest, if thou wantest Information in any of these Things, and dost but a little carefully animadvert upon what thou readest) I have my end; and thy kind Acceptance hereof will further oblige me,*

Who am thy Friend,

NATHANIEL COLSON.

ADVERTISEMENT.

THE

The Mariners New Kalendar.

The Principles of Arithmetick *briefly and plainly demonstrated. With the Extraction of the* Square *and* Cube Roots.

BEcause of the Usefulness, and indeed Necessity of some knowledg of *Arithmetick* in the Art of *Navigation*, it is requisite to begin with that, without which no orderly procedure can be made; And first of

Numeration.

NUmeration is that part of *Arithmetick*, whereby one may rightly express the value of any Number proposed.

All Numbers are expressed by these Characters following:

1, 2, 3, 4, 5, 6, 7, 8, 9, 0.
One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Cypher.

Altho *Cyphers* signify nothing by themselves, yet being put before (or to the right-hand of) other Figures, they encrease their value as much as if they were all Figures, as may plainly be seen in the Table following.

1	Unites	1
12	Tens	10
123	Hundreds	100
1234	Thousands	1000
12345	X Thousands	10000
123456	C Thousands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their vaalue according to the places they are set in; As 1 in the first place, or place of *Unites*, is *One*; in the second place, *Ten*; in the third place, *One Hundred*; in the fourth place, *One Thousand*; in the fifth place, *Ten Thousand*, &c.

The Table directs how properly to expreſs any given Number; As 123, which Number conſiſting of three places, is thus numbred, *One hundred twenty three*; this number 123456, conſiſting of ſix places, is thus expreſſed, *One hundred twenty three thouſand, four hundred fifty ſix*; and this number 123456789, conſiſting of nine places, is thus numbred, *One hundred twenty three Millions, four hundred fifty ſix thouſand, ſeven hundred eighty nine.*

Addition.

Addition is that which of ſeveral Sums makes but one Sum.

Example.

Suppoſe four Men (A. B. C. D.) owe me ſeveral Sums of Money, I would know how much is due to me in the whole; I begin at the firſt row towards the right-hand, and ſay 3 and 6 is 9, and 2 is 11, and 4 is 15; ſetting down the 5 under the row added up: then I carry the 1 ten to the next row, ſaying, 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; ſet down 9 under the row added up, and carry 1 to the next row, ſaying, 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; ſet down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13; which, becauſe this is the laſt row, I ſet down: So that by this Addition the whole Debt is found to be *Thirteen thouſand nine hundred ninety five pounds*

	l.
A oweth	3564
B———	5432
C———	3156
D———	1843
———	13995

Characters uſed in Arithmetick.

l.	Pounds.
s.	Shillings.
d.	Pence.
°	Degrees.
′	Minutes.
″	Seconds.

Example 2.

Suppoſe I have ſeveral Creditors to whom I owe ſeveral Sums of Money, I deſire to know the whole.

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Therefore begin again (as always in *Addition*) at the right hand, I ſay, 11 and 10 is 21, and 4 is 25, and 6 is 31; now conſidering how many Shillings there is in 31 *d.* I find 2 *s.* and 7 *d.* wherefore I ſet down the odd 7 *d.* under the row of Pence, and carry the 2 *s.* to the next row, being

Shillings,

Shillings, saying 2 and 4 is 6, and 8 is 14, and 9 is 23, and 11 is 34; that is 1 *l.* 14 *s.* set down 14 *s.* and carry the 1 *l.* to the next row, saying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; set down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; set down 2 and carry 1; lastly, 1 and 1 is 2: So that by this Addition the whole Debt is, *Two hundred twenty eight Pounds, fourteen Shillings, and seven Pence.*

Example 3.

Suppose at Sea keeping my Reckoning in degrees and minutes, having six Days difference of Longitude, I would know how much the whole is.

Say, 13 and 2 is 15, and 9 is 24, and 56 is 80, and 6 is 86; now 60 minutes making a degree, set down the odd 26 min. under the row of minutes, and carry the 1 deg. to the next row, being degrees; saying, 1 that I carry, and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7. So that the whole difference of Longitude made these six days, is 7 degrees and 26 minutes.

	°	′
1 day.	1	06
2 ——	0	56
3 ——	1	09
4 ——	2	00
5 ——	1	02
6 ——	1	13
	7	26.

Subtraction.

SUbtraction is the taking of a less Sum out of a greater, subscribing the Remainder.

Example.

	l.	*s.*	*d.*
Suppose a Man owed me ——	376	13	06
And hath paid me ——	211	05	08
I desire to know what remains unpaid, which is, ——	165	07	10

To work this, I say 8 from 6 I cannot, but considering there is 12 Pence contained in a Shilling, I add 12 to the 6, and say 8 from 18 and there remains 10, which set down under the Pence; and then having borrowed 1, I go to the next row, and say, 1 that I borrowed and 5 is 6, which taken out of 13 there remains 7; then proceeding to the Pounds, I say, 1 from 6 there remains 5, and 1 from 7 there remains 6; and lastly 2 from 3 there remains 1. So there remains due of the said Debt, *One hundred sixty five Pounds, seven Shillings, ten Pence.*

Ex-

Example 2.

Suppoſe the diſtance between two places to be 1000 Miles, and that I have ſailed 396, and deſire to know how many Miles I have to ſail.

Therefore placing 396 under the 1000, I ſay 6 from 0 I cannot, but 6 from 10, there remains 4; proceeding to the next Figure, I ſay, 1 that I borrowed and 9 is 10; from 0 I cannot, but 10 from 10, there remains 0: again, 1 that I borrowed and 3 is 4: from 0 I cannot, but 4 from 10, there remains 6; laſtly, 1 that I borrowed from 1, there remans 0. So there remains 604 Miles.

Miles.
1000
396
604

Example 3.

Suppoſe one place in the Latitude of 51 deg. 32 min. and another in the Latitude of 42 deg. 10 min. I would know the difference of Latitude between them.

To do which, ſubtract the leſs Latitude out of the greater thus; the leſſer being placed undermoſt, ſay, 10 from 32, there remains 22, which place under the Minutes; then for the Degrees, 2 from 1 I cannot, but 2 from 11 there remains 9, then 1 that I borrowed and 4 is 5, from 5 there remains 0. So the Difference of Latitude is *9 deg. 22 min.*

°	′
51	32
42	10
09	22

Multiplication.

Multiplication is that which ſerves in ſtead of many Additions, by which any number of a greater denomination is brought into a leſs, as Pounds into Shillings, and Shillings into Pence, and Pence into Farthings, Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by the Number of the leſſer which is contained in the greater, as the multiplying any number of Pounds by 20 (the number of Shillings contained in a Pound) brings it into Shillings; and ſo of the reſt.

Multiplication conſiſts of three parts.

1. The Multiplicand, or number to be multiplied.
2. The Multiplier, or number by which to multiply.
3. The Product made by the Multiplication.

For the Learners more ready procedure herein, it is neceſſary to inſert the Table, which is firſt to be committed to Memory.

The

The Multiplication Table.

2 times	2	4	5 times	5	25
	3	6		6	30
	4	8		7	35
	5	10		8	40
	6	12		9	45
	7	14			
	8	16	6 times	6	36
	9	18		7	42
3 times	3	9		8	48
	4	12		9	54
	5	15			
	6	18	7 times	7	49
	7	21		8	56
	8	24		9	63
	9	27			
			8 times	8	64
4 times	4	16		9	72
	5	20			
	6	24	9 times	9	81
	7	28			
	8	32	10 times	10	100
	9	36			

Example 1.

I demand how many Shillings there is in 5648 *l.*

To anſwer this, Multiply the given Number of Pounds by 20, thus; The firſt being a Cypher, ſet down 0 underneath the firſt Figure; then proceed to the next Figure, and ſay, 2 times 8 is 16; ſet down 6 under the ſecond Figure and carry 1; then 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is 12, ſet down 2 and carry 1; laſtly, 2 times 5 is 10, and 1 that I carried makes 11. So that 5648 *l.* multiplied by 20, makes 112960 Shillings.

l.
5648
20
112960

Example 2.

In 276 Degrees, how many Minutes?

First set down ——— 276
Then multiply by ——— 60
Because 60 Minutes make a Degree.

16560

So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

Example 3.

Multiply	8765437	Multiply	47632867
By	32	By	4352
	17530874		95265734
	26296311		238164335
Product	280493984		142898601
			190531468
			207298237184

Division.

Division is that which serves in the room of many *Subtractions*, and is useful in reducing of all Numbers of a lesser denomination into greater, as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and Shillings into Pounds. It consists of three parts, (*viz.*) Dividend, or the Number to be divided; Divisor, or the Number to divide by; and the Quotient, with the Remainder after Division.

Example 1.

To divide 7834 by 23; first say, How many times 2 in 7? or how often 23 in 78? the Answer will be 3 times, which place in the Quotient; then multiply the Divisor 23 by 3, the figure placed in Quotient, saying, 3 times 3 is 9, and 3 times 2 is 6, and place these under the two first figures of the Dividend, and draw a Line; subtract 69 from 78, and there

Divisor.	*Dividend*	*Quotient.*
23	7834	340
	69..	
	93	
	92	
	14 Remains.	

there reſts 9, which ſet underneath, and place a point under 3, to ſhew that it is brought down; place it to the 9, then proceed, ſaying, How many times 23 in 93? or how many times 2 in 9? which will be 4 times; place 4 in the Quotient, by which multiply the Diviſor; again, placing the Product, which is 92, under 93, and draw a Line, and ſubtracting it therefrom; the remainder 1 put under the Line, and ſet down 4 the laſt figure in the Dividend, putting a point under it, and place it to the remaining 1: Then becauſe there remains but 14, being leſs than the Diviſor 23, and ſo cannot be taken out of it, place a Cipher in the Quotient, and the Work is finiſhed.

Example 2.

In 360 Minutes, how many Degrees? Here I divide by 60, becauſe 60 Minutes make a Degree; and becauſe 6 cannot be taken out of 3, therefore I ſay, How many times 6 in 36? The anſwer is, 6 times: which I place in the Quotient, and proceed to multiply the Diviſor by the 6 placed in the Quotient, which produceth 360; which ſubtracted, leaves 0. So that by this Work it appears that in 360 Minutes there are 6 Degrees juſt.

Diviſor.	*Dividend.*	*Quotient.*
60	360	6
	360	
	00	

Example 3.

A Ship taken by 253 Men, is valued at 59875 *l.* I demand each Man's ſhare, being equally divided.

Diviſor.	*Dividend.*	*Quotient.*
253	59875	236
	506..	
	927	
	759	
	1685	
	1518	
	167 Remains.	

	236
	253
	708
	1180(7
	472(6
	(1
Proof.	59875

First, ſay, How many times 2 in 5? the anſwer is two times, which place in the Quotient; then multiply the Diviſor 253 by 2, the

figure placed in the Quotient, ſaying, 2 times 3 is 6, 2 times 5 is 10; ſet down 0 and carry 1; 2 times 2 is 4, and 1 is 5; which ſet down under the three firſt figures of the Diviſor, from whence being ſubtracted, ſet the Remainder underneath, which will be 92; then take down 7, making a point underneath, and ſet it after 92 the Remainder; then ſay, How often 2 in 9? Anſwer, 3 times, (for 4 times will prove too many.) Then multiply the Diviſor 253, as before, by 3, the figure laſt placed in the Quotient, and the Product will be 759, which being ſubtracted from the figures above, the Remainder will be 168; then take down 5, and point it as before, ſetting it after 168, the laſt Remainder; and again ask the Queſtion, How often 2 is contained in 16? Anſwer, 6 times; by which 6, when ſet in the Quotient, multiply the Diviſor 253; and the Product is 1518, which place under the laſt Dividend, and ſubtracted therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finiſhed, each Man's ſhare being 236 *l.* and 167 *l.* over, which is to be divided among them; which may eaſily be done by multiplying 167 by 240, and dividing the Product by 253, gives each Man's ſhare in Pence. The Proof is by multiplying 253 the Diviſor, by 236 the Quotient, and taking in 167 the Remainder, the Product will make the ſame with the Dividend, as it is wrought in the foregoing Page.

The Rule of Three.

THE *Rule of Three*, is that which having three Numbers given, a fourth Number is found in Proportion thereunto: which is done by multiplying the ſecond and third Numbers together, and dividing the Product by the firſt, and the Quotient of the ſaid Diviſion is the Anſwer to the Queſtion.

Example

Example 1.

If in 24 hours a Ship ſails 130 Miles: How many Miles will ſhe ſail with the ſame Gale in 192 hours, or eight days?

130
5760
192
24)24960(1040 Miles in 192 Hours.
24...
096
96
00

Here 24 is accounted the firſt Number, 130 the ſecond, and 192 the third; wherefore according to the Rule, I multiply 130 and 192, the ſecond and third Numbers together, and divide the Product thereof 24960 by 24 the firſt Number, which gives in the Quotienr 1040 Miles, which is the way the Ship will make in 192 Hours, the time propoſed.

Example 2.

If 1 ℔ of Tobacco coſt 6 *d.* what ſhall 112 ℔ coſt?

6
)672 Pence (or 56 Shillings.

Here the firſt number being an Unite, which neither multiplies nor divides, it ſaves the labour of the Diviſion, and the anſwer is 672 *d.* (for the Anſwer will be of the ſame name with the ſecond Number) which divided by 12, to bring them into Shillings, gives in the Quotient 56 *s.* which is the price of 112 ℔, as was required.

Example 3.

If a Staff of 2 Yards long give a ſhadow of 3 Yards; How high is that Caſtle whoſe ſhadow is, 100 Foot?

Which Queſtion for the more ready ſolution, ſtate thus:

If 6 foot (which is 2 yards) give 9 foot, what ſhall 100 foot give?

9
6)900(150 Foot.
6..
30
30
00

By the Operation it appears the ſaid Caſtle muſt be 150 Foot high.

Example

Example 4.

If 564 *l.* 12 *s.* 6 *d.* is to be divided between 165 Men, How much is one Man's ſhare? State it thus:

If 165 Men have 564 *l.* 12 *s.* 6 *d.* What ſhall 1 Man have?

20
11292
12
22590
11292

165)135510(821 Pence.
1320..
351
330
210
165
45

12)821(68 Shillings.
72
101
96
005 Pence.

Note, That in the *Rule of Three*, the firſt and third Numbers muſt be both of one Denomination, and the ſecond muſt be brought into the loweſt value expreſſed therein, as in the foregoing Example. I work not the Queſtion as it was firſt ſtated, but tranſpoſing the Numbers, I put the denomination of Men firſt and laſt, and the Mony in the midſt, to anſwer to that part of the Rule which requires the firſt and third Numbers to be both of one Name. Again, becauſe in the ſecond Number Pence are expreſſed, I therefore bring the whole Sum into Pence, which anſwers to the other part of the Rule, which requires the ſecond number into the loweſt value. The Anſwer therefore to the preceeding Queſtion, as by the Operation appears, is 821 Pence; which reduced into Shillings, is 68 *s.* and 5 *d.* or 3 *l.* 8 *s.* and 5 *d.* which is one Man's ſhare, as was required.

The next thing I ſhall briefly treat of, is, *The Extraction of the Square and Cube Roots*, as alſo ſomewhat of their uſe.

The Extraction of the Square Root.

Example 1.

	Root
	7056 (84
	64
	656 Div.
164)	656
	0

TO extract the Square Root of 7056, proceed thus: First, point the given number (that is, put a prick) over every other Figure, beginning at the firſt figure on the right hand (and note by the way, that ſo many Points as the ſaid Number admits over it, of ſo many Figures conſiſts the Root of the ſaid Number) then proceed ſeeking the greateſt ſquare number, (which is a number multiplied by it ſelf) in the firſt point towards the left hand (70) which is 64 conſtituted of 8 multiplied into it ſelf; for 8 times 8 is 64. The Root of the Square number, which is 8, place in the Quotient, and ſubſcribe the Square number (64) under the ſaid firſt point, ſubtracting it therefrom, and ſetting down the Remainder (6) underneath: To this Remainder bring down the next point (56); then drawing a crooked line on the left hand of the Dividend (656), double the Quotient, and place it (*viz.* 16.) therein, calling it the Diviſor; ſeek how often this Diviſor is contained in all the Figures of the Dividend, ſave the laſt to the right hand, (*viz.*) How many times 16 in 65? the anſwer is, 4 times, which place in the Quotient, and alſo on the right hand of the Diviſor (16), then multiply the Diviſor (164) by the 4 placed laſt in the Quotient, and put the Product, which is 656, under the Dividend, ſubtracting it there-from; which done, nothing remains. So that the Square Root of 7056 is 84.

The Square Root is applied to Navigation as follows.

Any two ſides of a Right-angled Plain Triangle being given, the third is found by the Extraction of the Square Root.

Example 2.

Suppoſe a Ship to have made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Diſtance to be required; the ſaid Diſtance is found by the Extraction of the Square Root, as follows.

The

The Rule.

Square the Difference of Latitude and Departure ſeverally, (that is, multiply each by it ſelf) and from the Sum of both their Squares added together, extract the Square Root, which will be the Diſtance required.

Example 1.

Difference of Lat. is 87.	The Departure 71.	Square Diff. Lat. 7569
Multiplied by it ſelf 87.	Multip. by it ſelf 71.	Square Depart. 5041
609	71	Sum 12610
696	497	
The Square — 7569	The Square 5041	

By this Operation it appears, that the Diſtance, omitting the Fraction, is 112 Miles.

12610 (112, the Diſtance required.
1
21) 026
21
222) 510
444
66

Example 2.

Suppoſe a Ships Diſtance to be 111 Miles, and her Departure 57 Miles, and the Difference of Latitude to be required; the ſaid Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule.

From the Square of the Diſtance ſubtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example

Extraction of the Square

Example.

The Distance ——— 111
Multiplied by it self ——— 111

111
111
111

Square of the Distance —— 12321
Square of the Depart. subtract. 3249
Remains —— 9072

The Depart[illegible] —— 57
Mult. by it self —— 57

399
285

Sq. of Depart. —— 3249

9072 (95 Diff. Lat. required.
1
185) 972
925
47

The Difference of Latitude, as by the Operation appears, is 95 miles omitting Fractions.

If the Departure be required, the Rule is this, *viz.* from the Square of the Distance, subtract the Square of Difference of Latitude, and the Square Root of the Remainder is the Departure required: the Operation for brevity-sake is omitted.

Having proceeded thus far in shewing the Practitioner how to find the Distance, Difference of Latitude and Departure, without the Operations by the Logarithms, I shall (because of its pertinency in this place) shew the manner of finding the Course also without the said Logarithmical Operation, which is done (without sensible error) as follows.

The Proportion to find the Course.

As the Sum of the Hypothenuse (or Distance) and half the greater of the other two Legs, (*viz.* if the Difference of Latitude be most, half that; but if the Departure be most, half that); I say, as the Sum of these two being added together, is in proportion to the lesser (or remaining) Leg, so is 86 to the Angle opposite to the less Leg; which is the Course, when the Departure is less than the Difference of Latitude, otherwise 'tis the Complement of the Course.

Example.

Admit a Ships Distance to be 112, the Difference of Latitude to be 88, and the Departure 69, and the Course to be required.

First, Add the Diſtance, and half the greater Leg into one Sum.

The Diſtance is ——— 112
Half the greater Leg (88) is——— 44
The Sum ——— 156

Having thus done, ſay by the Rule of Three:
As the ſaid Sum 156 to 96 the leſſer Leg, ſo is 86 to the Courſe.

To bring out the odd Minutes, multiply the Remainder of the Diviſion (6) by 60, (the number of Minutes contained in a Degree) and divide the Product by the Diviſor (156) and the Quotient of the ſaid Diviſion gives for the anſwer 2 Minutes. So that the Courſe required is 38 *deg.* 2 *min.*

69
774
516
156(5 4(38 *deg.* 2 *min.*
468.
1254
1248
6

Example 3. *Of the Extraction of the Square Root.*

Suppoſe a Rope of 5 Inches compaſs, and another Rope of double the ſtrength, is deſired. The Dimenſions of the ſaid required Rope is found by the Extraction of the Square Root: For ſhould it be ſuppoſed that a Rope of 10 Inches compaſs, is but double the ſtrength of a Rope of 5 Inches, upon proof it is manifeſtly falſe, for the ſaid Rope of 10 Inches is four times of the ſtrength of that of 5.

The Rule.

Take the compaſs of the given Rope (*viz.* 5.) and multiply that by it ſelf; which Product (becauſe the other Rope is to be twice as ſtrong) multiply by 2, and the Square Root of the Product is the compaſs of the Rope required.

Example.

The given Rope's compaſs 5 Inches.
Multiplied by it ſelf ——— 5
The Square ——— 25
Multiplied by —— —— 2
50

Extract the Root 50(70
49(
1

So

So that by the Operation it appears, a Rope to be twice the ſtrength of the given Rope of 5 Inches compaſs, muſt be 7 Inches, 0.

If it be deſired to know the weight of one Rope by another, it is as follows.

The Proportion is,

As the Square of the compaſs of the one Rope, is to the Square of the compaſs of the other; ſo is the weight of the one to the weight of the other, length for length.

Example.

Suppoſe a Cable of 10 Inches to weigh 21 hundred, and the weight of a Cable of 8 Inches required. Say;

As 100 (the Square of 10) to 64 (the Square of 8) ſo is 21 C, the weight of one Cable to 13 C. $\frac{44}{100}$ parts, the weight of the other Cable required.

Extraction of the Cube Root.

I Shall firſt as neceſſary inſert a Table of the Cubes of the Nine Digits, which ought firſt to be committed to memory.

Cubes of the Nine Digits.

1	001	6	216
2	008	7	343
3	027	8	512
4	064	9	729
5	125		

Example 1.

Extract the Cube Root of 12167.

Firſt point the given Number, (*i. e.*) put a prick over every third Figure, then ſeek the greateſt Cube in the firſt Point (*viz.* 12.) which is 8, the Cube Root whereof (which is 2) place in the Quotient; Subtract the Cube (8) from the firſt Point (12), place the Remainder underneath; to this Remainder bring down the next Point (167), and call this the

Reſolvend, then draw a Line underneath it, then ſquare the Quotient (2) which is 4, multiply the ſaid ſquere (4) by 300, which makes 1200; place this under the Reſolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30; which makes 60, place this under the Triple Square, and call it the Triple Quotient; add theſe two (*viz.* Triple Square and Triple Quotient) into one Sum, and call it the Diviſor; ſeek how often this Diviſor is contained in the Reſolvend, which is three times; which 3 place in the Quotient; multiply the Triple Square by the 3 laſt placed in the Quotient, and ſubſcribe the Product underneath the Diviſor; ſquare the ſaid figure (3) laſt placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the laſt Product; cube the figure (3) laſt placed in the Quotient, and place it underneath the preceding Products. Laſtly, Add theſe three Products into one ſum, and ſubtracting the ſaid ſum from the Reſolvend, ſubſcribe the Remainder; to which Remainder had there been any more Figures, the next point muſt have been brought down, and the preceding Work reiterated from the ſquaring of the Quotient, until all the Figures are ſo brought down; but in this Example, there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167, appears to be 23 juſt, nothing remaining.

12167	(23 Root.
8	
4167	Reſolvend.
1200	Triple Square.
60	Triple Quotient.
1260	Diviſor.
3600	
540	
27	
4167	
0000	

Example 2. *applied.*

Suppoſe a Ship of 300 Tun, 75 foot by the Keel, 29 foot and a half at the Beam, and 13 foot deep in the Hould; and another Ship is deſired of the ſame Mould and Shape of 500 Tun: The ſeveral Dimenſions of the ſaid Ship are found by the Extraction of the Cube Root.

Example.

Example.

Beginning with the Keel: First, Cube the length of the given Keel, which is done by multiplying it into it self, and then multiplying the Product by it again.

Then say by the Rule of Three, As 300 Tun the one Ships Burthen, to 500 Tun the other Ships Burthen; so is 421875 the Cube of the one Ships Keels length, to the Cube of the other Keels length. Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the length of the Keel required.

In this Extraction is added 3 Ciphers to bring out the Fraction, the Operation therewith being the same as if there had been more Figures in the proposed Number; the Operation gives for the length of the Keel required 88 foot $\frac{9}{10}$ parts.

Thus having found one of the Dimensions, the rest may be found without the Extraction of the Root by the Rule of Three.

Thus;

Suppose the next thing I would find, to be her breadth by the Beam, say; As the length of the one Ships Keel 75, is to the length of the other 89 *ferè*. So is 29 $\frac{1}{2}$ foot, the breadth of the one Ship by the Beam, to the breadth of the other, which by the Rule of Three gives 35 foot $\frac{3}{5}$.

75	given Keel.
75	
375	
525	
5625	
75	
28125	
39375	
421875	Cube given Keel.

703125	88 Root.
512	$\frac{9}{10}$
191125	Resolvend.
19200	Triple Square.
240	Triple Quotient.
19440	Divisor.
153600	
15360	
512	
169472	

21653.	000	Resolvend.
2323	200	T. S.
2	640	T. Q.
2325	840	Divisor.
20908	800	
213	840	
	729	
21123	369	
529	631	Remainder.

Example.

Example 3.

Suppoſe an Iron Shot, 4 Inches Diameter, to weigh 9 ℔, and the Diameter of a Shot whoſe weight is 72 ℔ required. This alſo is done by the Extraction of the Cube Root, as follows: Firſt, ſay by the Rule of Three;

As 9 ℔, the weight of one Shot, to 72 ℔, the weight of the other, ſo is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter: which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

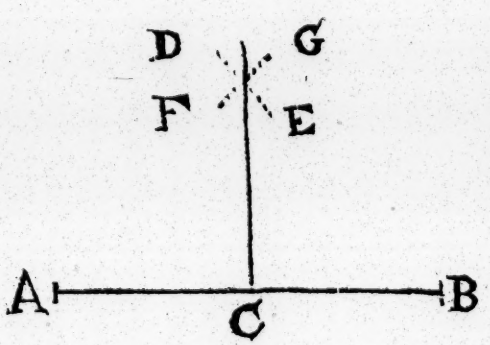
But if it were required, to find the weight of a Shot by the Diameter, it's done thus, by the Rule of Three.

As the Cube of the one Shot's Diameter to the Cube of the other;
So is the weight of the one Shot to the weight of the other required.
And thus much for the Arithmetical part of this Treatiſe.

Some neceſſary Geometrical Problems.

PROBLEM I.

To raiſe a Perpendicular on the middle of a Line.

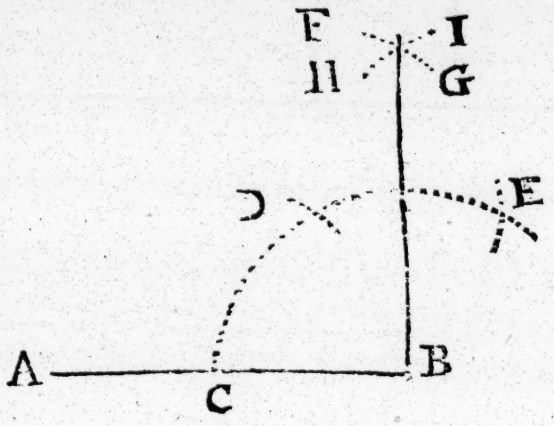


LET the Line given be A B, and the Perpendicular to be raiſed from the point C; to do which, ſet off the two equal Diſtances, C A and C B: Then the Compaſſes being opened to any convenient Diſtance bigger than A C or C B, with one foot of the Compaſſes in the Point A, deſcribe the Arch D E; then with one foot in the Point B deſcribe the Arch F G, then draw the Perpendicular from the point C through the Interſection (or cutting) of the two Arches F G and D E, which was required.

PROB.

PROB. II.

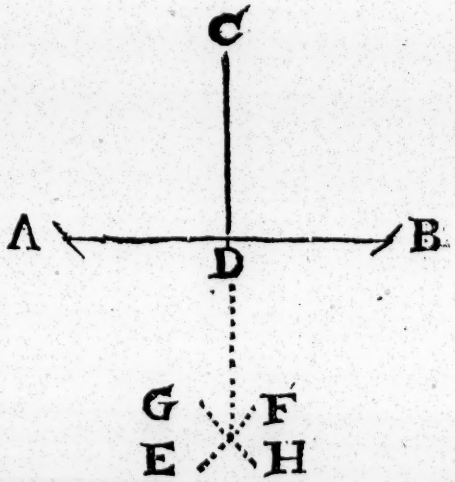
To raiſe a Perpendicular on the end of a Line.



Let the Line given be A B, and the Perpendicular to be raiſed from the Point B: to do which, with one foot of the Compaſſes at B, with any convenient diſtance, as B C, ſweep an Arch; then with the ſame extent, one foot of the Compaſſes being in the point C, mark the ſaid Arch at the point D, and one foot being at D, mark it at E; then with the ſame diſtance, one foot of the Compaſſes being in the point D, deſcribe the Arch F G, and placing the Compaſſes in the point B, deſcribe the Arch H I; then from the point B, and through the interſection of the two Arches, F G and H I; draw the Perpendicular which was required.

PROB. III.

To let fall a Perpendicular on the middle of a Line, from a certain Point aſſigned over the ſaid Line.

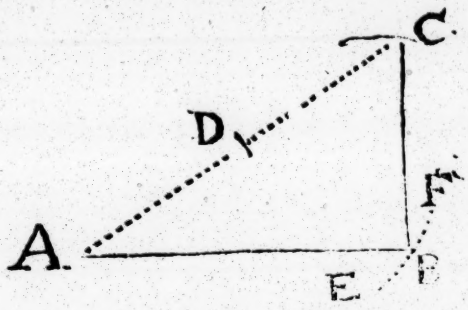


Let A B be the Line given, C the point over the Line, from which the Perpendicular is to fall, to do which, place one foot of the Compaſſes in the point C, then opening them to a convenient diſtance, mark the Line A B in two points with the ſaid diſtance, as in the points A and B; then with one foot of the Compaſſes in the point A, deſcribe the Arch E F; and with one foot in the point B, deſcribe the Arch G H, then from the point C, and by the interſection of the ſaid two Arches, draw the Perpendicular which was required.

PROB

PROB. IV.

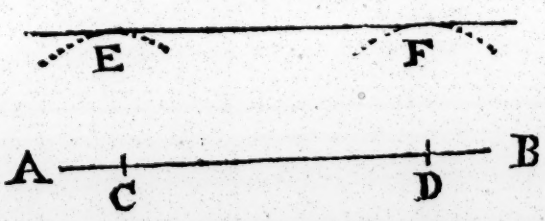
To let fall a Perpendicular on the end of a Line, from a Point assigned.



Let the Line given be A B, upon the end of which let it be required to let fall a Perpendicular from the point C; to do which, from the point assigned C, draw the Line C A; which Line divided into two equal parts, as in the point D, then one point of the Compasses resting in the point D, with the same distance, (*viz.* of half the Line A C) describe the Arch E F; then from the point C, to the intersection of the Arch E F with the Line A B, draw the Perpendicular as was required.

PROB. V.

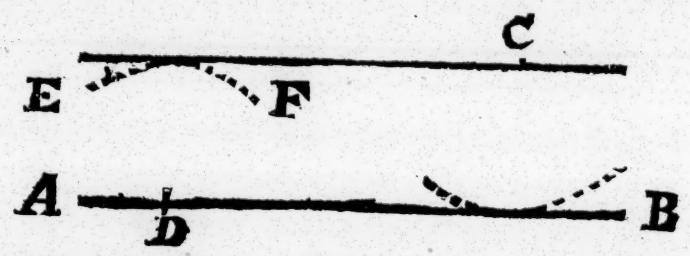
To draw a Line Parallel to a Line given.



Let A B be a Line given, to which is required to draw a Line parallel; to do which, first, Take in the Compasses the distance at which the parallel Line is to be drawn, and then setting one foot of the Compasses in the point C, on the Line A B describe the Arch E; and with the same distance, with one foot of the Compasses in the point D, describe the Arch F; then laying a Ruler to touch the convexity of the two Arches, draw the Parallel as was required.

PROB. VI.

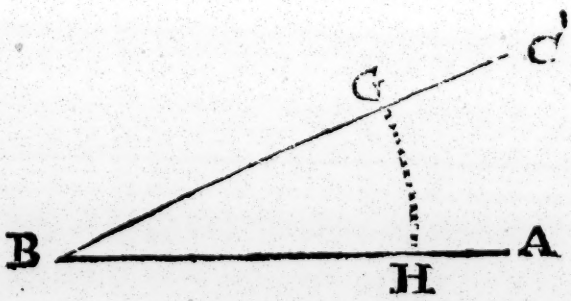
To draw a Line Parallel to a given Line, that ſhall paſs through a point aſſigned over the ſaid given Line.

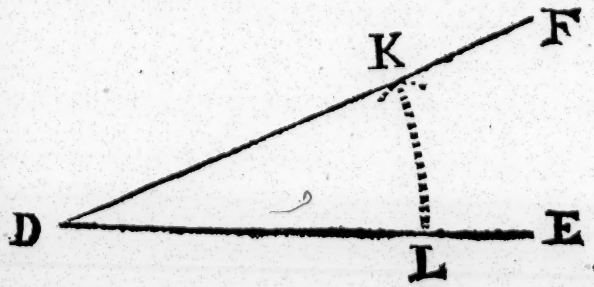


Suppoſe A B the given Line, and it is required to draw a Line Parallel thereto that ſhall paſs through the Point C: Firſt, take the neareſt diſtance between the ſaid point and the given Line, and with the ſaid diſtance, ſetting one foot of the Compaſſes in the Point D, deſcribe the Arch E F; then by the Convexity of the ſaid Arch, and the given point C, draw the Parallel as was required.

PROB. VII.

To make an Angle equal to any given Angle.

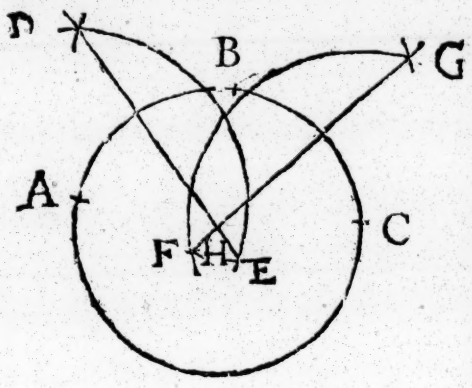




Suppoſe A B C an Angle given, and it is required to make another Angle equal thereto: To do this, firſt, draw the Line D E, then with any convenient diſtance leſs than A B, deſcribe the Arch G H; then placing the Compaſſes at D; with the ſame diſtance which ſwept the Arch G H, ſweep the Arch K L; then take the length of the Arch G H in the Compaſſes, and ſetting one foot in the point L, croſs the Arch L K in the point K, then through the point K draw the Line D F; then is the Angle E D F, equal to the Angle A B C, as was required.

PROB. VIII.

To bring any three Ponts not ſcituate in a right Line, into the Circumference of a Circle.



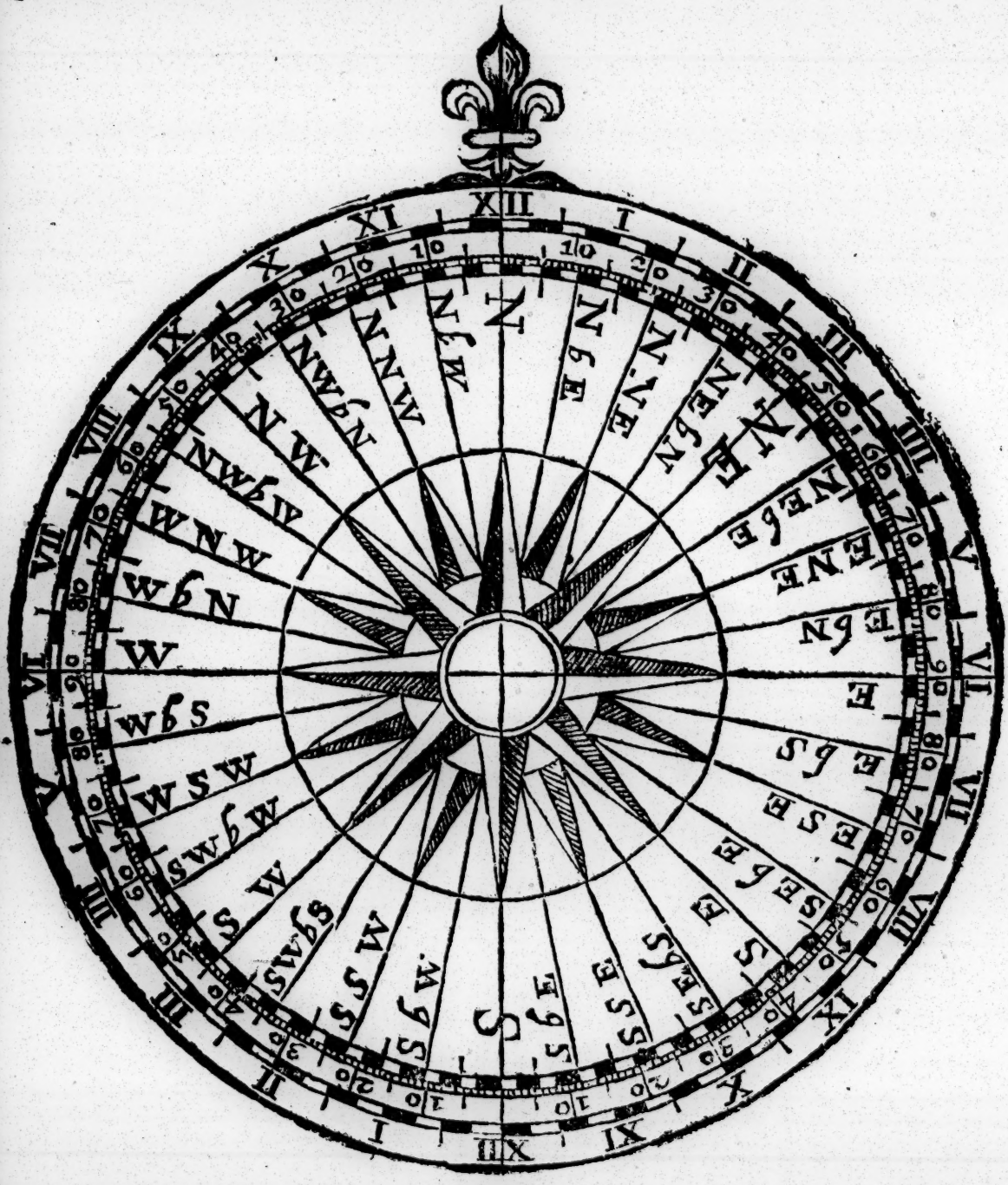
Let the three Points, through which the Circle is to paſs, be A B C: Take above half the Diſtance between the two Points A and C in the Compaſſes, and one foot of the Compaſſes being in the Point A, with the ſaid Diſtance deſcribe the Arch E D, and with the ſame diſtance, one foot of the Compaſſes being in the Point B, mark the Arch E D in the points E D, and draw the right Line E D; then take above half the diſtance between the Points C and B in the Compaſſes, and one foot of the Compaſſes being in the Point C, with the ſaid diſtance deſcribe the Arch F G; and with the ſame diſtance, one foot of the Compaſſes being in the Point B, mark the Arch F G in the Points F and G and draw the right Line F G. Now where the two right Lines D E and F G, being continued, interſect each other, (*viz.* in the Point H) is the Center of the Circle which was required.

Of the Mariner's Compaſs.

THIS Inſtrument ſo beneficially aſſiſtent to the practical part of Navigation, as to its Author, is uncertainly diſcourſed of; its Age, by ſome ſuppoſed to be in theſe parts of the World, about 300 Years the utility whereof to us evidently appears, conſidering the many inconveniencies that attended our Anceſtors, in tracing the Vaſt Ocean for want of ſuch a Guide, under whoſe ſubordinate Conduct of later Years, our Maritime Affairs have ſucceeded ſo well.

The Description of the Compass.

It is a Circle of a greater or lesser Diameter at pleasure, described upon a Paste-Board, and divided into 360 Degrees, and 32 Points, and sometimes into 24 Hours, each Point containing 11 deg. 15 min. or three quarters of an Hour, as in the following Figure.



To divide which into Points, firſt draw a Line at pleaſure, as W.E. then croſs it with another at right Angles, as N. S. then ſetting one foot of the Compaſſes in the interſection (or cutting) of thoſe two Lines, the Compaſſes being opened to the intended bigneſs, ſweep the Circle, and divide each of the four equal parts made by the Circle, and the two right Lines W. E. and N.S. into eight equal parts more. So is the Compaſs divided into 32 Points, as in the foregoing Figure.

The Circle being thus divided upon the Chard, or Paſte-Board, there are paſted on the other ſide of the ſaid Chard, or Paſte-Board, two Wiers, which Wiers being touched with a Loadſtone, and the Chard hung at the Center upon a Pin, fixed in a Box, its Poſition becomes North and South; and the ſaid Box being covered with a Glaſs, and hung into another ſquare Box, to the end the Chard may traverſe notwithſtanding the Ships motion; being thus fixed, is ready for uſe.

To find the Prime, or Golden Number.

THE *Prime* or *Golden Number*, is the ſpace of 19 Years, in which the Moon performs all her Revolutions with the Sun; at the end of which term, the Moon returns again to the ſame Sign and Degree in the *Zodiack* which ſhe was in 19 years before; for the finding whereof add 1 to the date of the year, and divide by 19, and the Remainder after diviſion will be the number required.

Example.

Suppoſe the *Golden Number* to be required for the year 1685; firſt add 1, which makes 1686, then divide by 19.

19)1686(88
152
166
152
14 Remains, which is the *Golden Number.*

To find the Epact.

THE *Epact* is the difference which is made in a year between the Sun and Moon in their Revolutions; to find which, divide the *Golden Number* by 3, and for every one that is left add 10 to the *Prime*; then if the ſum exceed 30, caſt away 30, and the Remainder is the *Epact*; but if the ſum be leſs than 30, that is the *Epact*; but if there remains 0 after Diviſion, the *Epact* is the ſame with the *Golden Number.* *Example.*

Example

Suppoſe the Epact was required for the year 1685; the Golden Number being found to be 14, being divided by 3, there remains 2, which being made 20, and added to the Prime 14, makes 34, which is the Epact for 1685 required.

To find the Moon's Age.

ADD to the Epact, for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *Auguſt* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the number for the Month, according to the Rule foregoing, add thereto the day of the Month, for which the Moon's Age is required: theſe 3 ſums added together, if leſs than 30, is the Moon's Age; if more than 30, take 30 from it as often as may be, the Remainder is the Age of the Moon. The Moon's Age ſubtracted from 30, leaves the day of the Change. Again, 15 added to, or ſubtracted from the day of Change, leaves the day of Full Moon.

Example.

Suppoſe it were required to find the Moon's Age for the fifth day of *September* 1688.

First ſet down the Epact for that Year ——— 07
To which add the Number for the Month, which is ——— 08
To which add the Day of the Month, which is ——— 05

The Moon is 22 days old.

Then out of 30
Take ——— 22 The Moon's Age.
Remains — 08 Days to the Change.
Add ——— 15
Makes ——— 23 Days to Full Moon.

If the Practitioner pleaſe to ſave himſelf the labour of theſe Operations, he may in the following Page, ſee the Table where it is ſet down.

To find the Dominical Letter.

TAke the Year and its fourth part, and add 4 to it; then divide the Sum by 7, and ſubtract what remains from 7, the Remainder ſhews the thing required; accounting the Letter A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, and G for 7. Sup-

Suppoſe the Dominical Letter were required for the year 1685.
First, ſet down the year ——— 1685
Then the 4*th* part, which omitting Fraction, is ——— 421
To which add ——— 4

2110

The Sum divide by ——— 7) 2110 (301
21

010
10

The Remainder after Diviſion is 3, which being ſubtracted from 7, leaves 4; which ſhews it muſt be the fourth Letter, which is D the Dominical Letter for 1685 required.

3

To find the Cycle of the Sun.

ADD to the Year 9, divide the ſum by 28, the Remainder is the Cycle of the Sun.

Suppoſe it be required for the Year 1685
Then add ——— 9

Divide by ——— 28) 1694 (60
168

By the Operation it appears that 14 is the Cycle of the Sun for the Year 1685, being the Remainder after diviſion.

14

To ſave this labour, I ſhall add the Table following.

Note, *Hillary* Term begins *Jan.* 23. and ends *Feb.* 12.
Eaſter Term begins 17 days after *Eaſter-day*, and ends the Monday before *Whitſunday*.
Trinity Term begins on Friday after *Trinity-Sunday*, and ends 19 days after.
Michaelmas Term begins *Octob.* 23. and ends *November* 28.

A Table

A Table of the Dominical Letters, Cycle of the Sun, Prime, Epact, *and* Moveable Feasts *for Twenty Three Years.*

Years	Dom. Let.	Cycl. ☉.	Prime.	Epact.	Shrove-Sunday.		Easter-Sunday.		White-Sunday.	
1688	A G	17	17	7	*February*	26	*April*	15	*June*	3
1689	F	18	18	18		10	*March*	31	*May*	19
1690	E	19	19	29	*March*	2	*April*	20	*June*	8
1691	D	20	1	11	*February*	23		12	*May*	31
1692	C B	21	2	22		7	*March*	27		15
1693	A	22	3	3		26	*April*	16	*June*	4
1694	G	23	4	14		18		8	*May*	27
1695	F	24	5	25	*March*	3		25		12
1696	E D	25	6	6	*February*	23		12		31
1697	C	26	7	17		14	*April*	4	*May*	23
1698	B	27	8	28	*March*	6		24	*June*	12
1699	A	28	9	9	*February*	19		9	*May*	28
1700	G F	1	10	10		11	*March*	31	*May*	19
1701	E	2	11	1	*March*	2	*April*	20	*June*	8
1702	D	3	12	12	*February*	15		5	*May*	24
1703	C	4	13	23		7	*March*	28		16
1704	B A	5	14	4		27	*April*	16	*June*	4
1705	G	6	15	15		18		8	*May*	27
1706	F	7	16	26		4	*March*	24		12
1707	E	8	17	7		24	*April*	13	*June*	1
1708	D C	9	18	18		14		4	*May*	23
1709	B	10	19	29	*March*	6		24	*June*	12
1710	A	11	1	11	*February*	19	*April*	9	*May*	28

M.		D.	H.	M.
January.	Full moon.	07	01	12
	Last quart.	15	04	50
	New moon.	22	10	12
	First quart.	29	00	57
February.	Full moon.	05	19	04
	Last quart.	13	22	30
	New moon.	20	20	24
	First quart.	27	12	39
March.	Full moon.	06	13	58
	Last quart.	14	13	14
	New moon.	21	05	15
	First quart.	28	02	29
April.	Full moon.	05	06	04
	Last quart.	13	00	04
	New moon.	19	15	27
	First quart.	26	18	14
May.	Full moon.	04	21	36
	Last quart.	12	06	56
	New moon.	18	16	10
	First quart.	26	10	41
June.	Full moon.	03	09	56
	Last quart.	10	05	46
	New moon.	17	08	05
	First quart.	25	03	34
July.	Full moon.	02	20	38
	Last quart.	09	15	10
	New moon.	16	19	47
	First quart.	24	20	34
August.	Full moon.	01	05	49
	Last quart.	07	20	45
	New moon.	15	09	10
	First quart.	23	12	34
	Full moon.	30	14	26
September.	Last quart.	06	04	28
	New moon.	14	00	49
	First quart.	22	03	42
	Full moon.	28	23	00
October.	Last quart.	05	16	56
	New moon.	13	08	40
	First quart.	21	16	59
	Full moon.	28	08	12
November.	Last quart.	04	02	51
	New moon.	12	12	54
	First quart.	20	04	08
	Full moon.	26	19	05
December.	Last quart.	04	06	15
	New moon.	12	06	58
	First quart.	19	13	02
	Full moon.	27	07	42

This Year will be Four Eclipses, Two of the Sun, and two of the Moon.

1. Of the Moon on *April* 5. about 6 of the Clock in the Evening. 'Twill be a great Eclipse, but not seen to us. 2. Of the Sun on *April* 25. about 3 in the morning; Visible to us in *England*. 3. Of the Moon, on *Septemb.* 29. about 10 in the Morning, and visible to us. 4. Of the Sun, on *Octob.* 14. about 7 of the Clock in the Morning, and the latter part may be seen in *England*.

M.		D.	H.	M.
January.	Last quart.	03	01	02
	New moon.	10	22	10
	First quart.	17	20	26
	Full moon.	24	21	12
February.	Last quart.	01	11	56
	New moon.	09	11	21
	First quart.	16	03	41
	Full moon.	23	14	12
March.	Last quart.	03	17	08
	New moon.	10	21	57
	First quart.	17	12	17
	Full moon.	25	16	04
April.	Last quart.	02	09	31
	New moon.	09	06	32
	First quart.	15	22	42
	Full moon.	23	23	00
May.	Last quart.	01	22	26
	New moon.	08	13	34
	First quart.	15	11	21
	Full Moon.	23	14	19
	Last quart.	31	07	40
June.	New moon.	06	22	08
	First quart.	14	01	51
	Full moon.	22	04	18
	Last quart.	29	13	56

M.		D.	H.	M.
July.	New moon.	06	05	28
	First quart.	13	17	54
	Full moon.	21	16	58
	Last quart.	28	18	07
August.	New moon.	04	15	21
	First quart.	12	11	13
	Full moon.	20	04	17
	Last quart.	26	22	38
September.	New moon.	03	03	39
	First quart.	11	05	17
	Full moon.	18	17	46
	Last quart.	25	03	20
October.	New moon.	02	18	55
	First quart.	10	23	00
	Full moon.	18	00	40
	Last quart.	24	14	21
November.	New moon.	01	12	35
	First quart.	09	15	35
	Full moon.	16	10	32
	Last quart.	23	05	22
December.	New moon.	01	01	04
	First quart.	09	06	00
	Full moon.	15	22	02
	Last quart.	22	22	42
	New moon.	30	03	02

In this Year will be two Eclipses, both of the Moon.

The first will be on *March* 25. about seven of the Clock at Night; this will be both total and visible. The second will be on *September* 19. about two of the Clock in the Morning, total and visible, as the former.

M.		D.	H.	M.
January.	First quart.	07	16	53
	Full moon.	14	15	38
	Last quart.	21	18	08
	New moon.	29	20	17
February.	First quart.	06	01	49
	Full moon.	12	20	39
	Last quart.	20	14	24
	New moon.	28	11	04
March.	First quart.	07	08	06
	Full moon.	14	10	14
	Last quart.	22	09	46
	New moon.	29	22	08
April.	First quart.	05	14	02
	Full moon.	13	21	34
	Last quart.	21	03	07
	New moon.	28	06	59
May.	First quart.	04	21	00
	Full moon.	12	15	19
	Last quart.	20	17	53
	New moon.	27	14	31
June.	First quart.	03	06	30
	Full moon.	11	04	13
	Last quart.	19	05	43
	New moon.	25	21	21

M.		D.	H.	M.
July.	First quart.	02	18	27
	Full moon.	10	21	28
	Last quart.	18	14	45
	New moon.	25	04	42
August.	First quart.	01	09	18
	Full moon.	09	11	45
	Last quart.	16	21	32
	New moon.	23	13	21
	First quart.	31	02	23
September.	Full moon.	08	01	42
	Last quart.	15	03	08
	New moon.	22	00	32
	First quart.	29	21	12
October.	Full moon.	07	14	26
	Last quart.	14	10	35
	New moon.	21	13	10
	First quart.	29	15	19
November.	Full moon.	06	00	25
	Last quart.	12	16	52
	New moon.	20	07	34
	First quart.	28	09	51
December.	Full moon.	05	13	17
	Last quart.	12	04	31
	New moon.	20	02	48
	First quart.	28	05	12

In this Year there will be Four Eclipses, two of the Sun, and two of the Moon.

The first will be of the Sun, on *Feb.* 28. about 11 of the Clock at Night; it will be invisible to us in *England*. The second will be a Lunar Eclipse, *March* 14. about 10 of the Clock at Night; visible to us in *England*. The third will be an Eclipse of the Sun, *August* 24. about one in the Morning, a great Eclipse, but invisible to us. The fourth will be an Eclipse of the Moon, on *Septemb.* 8. about two of the Clock in the Afternoon.

M.		D.	H.	M.
January.	Full moon.	03	23	47
	Last quart.	10	19	02
	New moon.	18	22	15
	First quart.	26	19	08
February.	Full moon.	02	10	01
	Last quart.	09	12	16
	New moon.	17	16	35
	First quart.	25	05	46
March.	Full moon.	03	20	32
	Last quart.	11	06	37
	New moon.	19	08	01
	First quart.	26	13	43
April.	Full moon.	02	07	49
	Last quart.	10	01	12
	New moon.	17	21	47
	First quart.	24	19	11
May.	Full moon.	01	20	19
	Last quart.	09	17	44
	New moon.	17	06	36
	First quart.	24	21	57
	Full Moon.	31	08	01
June.	Last quart.	08	10	53
	New moon.	15	14	45
	First quart.	22	04	31
	Full moon.	29	22	32
July.	Last quart.	08	01	09
	New moon.	14	21	56
	First quart.	21	13	50
	Full moon.	29	13	36
August.	Last quart.	06	13	13
	New moon.	13	04	57
	First quart.	20	02	29
	Full moon.	28	05	23
September.	Last quart.	04	23	07
	New moon.	11	13	20
	First quart.	18	18	20
	Full moon.	26	21	14
October.	Last quart.	04	06	49
	New moon.	11	01	11
	First quart.	18	13	16
	Full moon.	26	12	36
November.	Last quart.	02	13	49
	New moon.	09	12	22
	First quart.	17	09	51
	Full moon.	25	02	36
December.	Last quart.	01	21	01
	New moon.	09	01	58
	First quart.	17	06	40
	Full moon.	24	15	16
	Last quart.	31	04	36

In this Year will be two Eclipses, both of the Sun.

The first will be on *February* the 18*th*, about our five a Clock in the Morning; but invisible to us. The second will be on *August* the 13*th* near six of the Clock at Night; visible to us in *England*, if the Air be serene $\frac{3}{4}$ of the Suns Body will be obscured.

M.		D.	H.	M.
January.	New moon.	07	21	52
	First quart.	16	00	46
	Full moon.	23	02	30
	Last quart.	29	17	34
February.	New moon.	06	16	31
	First quart.	14	18	26
	Full moon.	21	11	48
	Last quart.	28	07	37
March.	New moon.	07	10	30
	First quart.	15	01	42
	Full moon.	21	20	53
	Last quart.	28	23	36
April.	New moon.	06	03	06
	First quart.	13	15	33
	Full moon.	20	05	49
	Last quart.	27	16	06
May.	New moon.	05	16	48
	First quart.	12	20	48
	Full moon.	19	15	40
	Last quart.	27	09	09
June.	New moon.	04	04	28
	First quart.	11	00	37
	Full moon.	18	02	22
	Last quart.	26	02	04

M.		D.	H.	M.
July.	New moon.	03	16	25
	First quart.	10	05	14
	Full moon.	17	15	09
	Last quart.	25	17	51
August.	New moon.	01	21	48
	First quart.	08	11	44
	Full moon.	16	05	55
	Last quart.	24	09	05
	New moon.	31	05	49
September.	First quart.	06	22	04
	Full moon.	14	22	26
	Last quart.	22	21	13
	New moon.	29	14	24
October.	First quart.	06	12	30
	Full moon.	14	15	52
	Last quart.	22	09	32
	New moon.	29	00	36
November.	First quart.	05	06	46
	Full moon.	13	09	46
	Last quart.	20	18	43
	New moon.	27	11	48
December.	First quart.	05	02	40
	Full moon.	13	01	50
	Last quart.	20	00	46
	New moon.	27	01	35

In this Year there will be Five Eclipses, three of the Sun, and two of the Moon.

The first will be of the Moon, on *Jan.* 23. about two of the Clock Afternoon; invisible to us. The second of the Sun, on *Feb.* 9. near five in the Afternoon; invisible to us. The third a great Eclipse of the Moon on the 18*th* of *July*, near four of the Clock in the Morning, may be seen of us. The fourth an Eclipse of the Sun, on the second of *August* about nine in the Morning. The last a small Eclipse of the Sun, on *Decemb.* 27. two hours Afternoon, scarce visible to us.

M.		D.	H.	M.
January.	First quart.	04	00	03
	Full moon.	11	16	00
	Last quart.	18	09	55
	New moon.	25	17	38
February.	First quart.	02	19	53
	Full moon.	10	03	52
	Last quart.	16	20	13
	New moon.	24	10	50
March.	First quart.	04	14	17
	Full Moon.	11	13	32
	Last quart.	18	05	19
	New moon.	26	04	02
April.	First quart.	03	04	52
	Full moon.	09	21	44
	Last quart.	16	17	56
	New moon	24	20	20
May.	First quart.	02	05	47
	Full moon.	09	05	37
	Last quart.	16	07	59
	New moon.	24	11	07
	First quart.	31	21	28
June.	Full moon.	07	13	36
	Last quart.	14	23	37
	New moon.	22	23	56
	First quart.	30	03	44

M.		D.	H.	M.
July.	Full moon.	06	22	40
	Last quart.	14	16	22
	New moon.	22	11	07
	First quart.	29	07	33
August.	Full moon.	05	09	50
	Last quart.	13	09	58
	New moon.	20	21	26
	First quart.	27	12	39
September.	Full moon.	03	23	34
	Last quart.	12	01	00
	New moon.	19	06	57
	First quart.	25	01	10
October.	Full moon.	03	15	41
	Last quart.	11	19	25
	New moon.	18	16	17
	First quart.	25	09	14
November.	Full moon.	02	09	16
	Last quart.	10	10	02
	New moon.	17	02	09
	First quart.	24	00	42
December.	Full moon.	20	05	16
	Last quart.	09	22	28
	New moon.	16	11	17
	First quart.	23	20	03

* *In this Year are four Eclipses, two of the Sun, and two of the Moon.*

The First a total Eclipse of the Moon, on *January* 12. about four of the Clock in the morning, visible to us. The Second a great Eclipse of the Sun, on *June* 23. a little after Noon. The Third a great Eclipse of the Moon, on *July* 7. near 10 in the Morning, invisible to us. The last a great Eclipse of the Sun, on *Decemb.* 16. about our Midnight, visible to our *Antipodes*.

M.		D.	H.	M.
January.	Full moon.	01	00	21
	Laſt quart.	08	07	53
	New moon.	15	01	14
	Firſt quart.	22	19	39
	Full moon.	30	15	34
Febr.	Laſt quart.	06	15	07
	New moon.	13	14	50
	Firſt quart.	21	13	01
March.	Full moon.	01	04	13
	Laſt quart.	07	21	40
	New moon.	15	05	41
	Firſt quart.	23	07	52
	Full Moon.	30		
April.	Laſt quart.	06	04	50
	New moon	13	21	06
	Firſt quart.	22	00	05
	Full moon.	28	22	13
May.	Laſt quart.	05	14	02
	New moon.	13	12	41
	Firſt quart.	21	13	11
	Full moon.	28	15	56
June.	Laſt quart.	04	01	28
	New moon.	12	03	22
	Firſt quart.	19	23	22
	Full moon.	26	11	51

M.		D.	H.	M.
July.	Laſt quart.	03	15	09
	New moon.	11	18	06
	Firſt quart.	19	06	01
	Full moon.	25	20	50
Auguſt.	Laſt quart.	02	07	04
	New moon.	10	07	27
	Firſt quart.	17	11	12
	Full moon.	24	06	30
September.	Laſt quart.	01	00	55
	New moon.	08	20	10
	Firſt quart.	15	17	01
	Full moon.	22	19	08
	Laſt quart.	30	19	44
October.	New moon.	08	07	32
	Firſt quart.	14	22	48
	Full moon.	22	10	34
	Laſt quart.	30	14	36
November.	New moon.	06	18	20
	Firſt quart.	13	08	46
	Full moon.	21	04	42
	Laſt quart.	29	08	14
December.	New moon.	06	04	43
	Firſt quart.	12	22	20
	Full moon.	21	00	08
	Laſt quart.	29	23	31

In this Year are four Eclipſes, two of the Sun, and two of the Moon.

The Firſt of the Moon, *Jan.* 1. about Noon, a great Eclipſe to the *Antipodes*. The Second of the Sun, *June* 12. near 5 of the Clock at Night, more than half the Sun's Body obſcured; may be ſeen of us if the Air be clear. The Third a ſmall Eclipſe of the Moon about Midnight, on *June* 26. The Laſt an Eclipſe of the Sun, on *Decemb.* 6. near 5 at Night; inviſible to us.

The Explanation and Uſe of the preceding Table of the Moon's Age.

IN the ſaid Table, the one half Page contains the firſt ſix Months of the Year, the other half the following ſix Months: in the firſt Column of each half, towards the left hand, are the Months; in the ſecond, the New, Full, and Quarters of the Moon; in the three following Columns are the Days, Hours and Minutrs of the ſaid New, Full and Quarters; which time is accounted from Noon to Noon. At the bottom of the Tables are the Eclipſes for the Reſpective Years.

Uſe of the Table.

The Uſe of this Table is readily by Inſpection to find the Day, Hour and Minute of the New, Full or Quarters of the Moon.

Example 1.

Suppoſe it were deſired to find the time of New Moon in *Jan.* 1688.

Firſt, Look for the Year 1688, on the top of the Leaf, which having found, look for *January* in the firſt Column towards the left Hand; then in the next Column, in the ſame Month, is found New Moon; and in the three following Columns againſt New Moon, ſtands 22|10|12|, which ſhews that the New Moon in *January* 1688, is the 22 day, 10 hours, 12 minutes Afternoon. The ſame Directions and Conſiderations ſerve for the Full Moon, or firſt and laſt Quarters.

Note, That when the Moon is in the firſt Quarter, it is 8 days old, at the Full 15 days, and in the laſt Quarter 22 days. Suppoſe therefore it were required to find the Moons Age on *March* 25, 1688.

Looking in the Year 1688, the Table gives the New Moon to be on the 21*ſt* day, therefore 21 and 4 being 25, it appears the Moon is 4 days old on the ſaid 25*th* of *March*.

Example 2.

Suppoſe it were required to find the Moons Age on the 10*th* of *June*, 1688.

Looking in the Year 1688, in the Month of *June*, I find the Moon to be at the Full on the 3*d* day, that is, 15 days old; then the day for which I would find its Age, being 7 days after the 3*d* day, 15 and 7 making 22, I conclude the Moon to be 22 days old on the ſaid 10*th* day of *June*, 1688.

A Tide

A Tide-Table for the Sea-Coaſt of Great Britain, Ireland, Norway, Holland, Flanders, France, Biſcay, *&c. Shewing what Moon makes Full Sea upon the Full and Change-days at the places following, in Alphabetical order.*

	H.	M.
A.		
AT *Army*, N. N. E. and S. S. W.	01	30
At *Amſterdam*, and *Armentiers*, North-eaſt, and South-weſt	03	00
At *Aberwark*, E. N. E. and W. S. W.	04	30
At *Abermorick* and *Antwerp*, Eaſt and Weſt.	06	00
At *Alborough*, South-Eaſt by South, and North-Weſt by North	06	45
B.		
At *Beachy*, and before the *Race* of *Blanquet*, North and South	12	00
At *Blacktail* and thwart of *Beachy* in the *Offing*, North by Eaſt, and South by Weſt	12	45
At *Blackneſs* in *Bluet*, at *Bell-Iſle*, at *Baraick*, N. N. E. and S. S. W.	01	30
Without *Bluet*, North-Eaſt by North, and South-Weſt by South	02	15
The River of *Bourdeaux*, the South-Coaſt of *Britaign*, the Coaſt of *Biſcay*, and at *Rockneſs*, North-Eaſt and South-Weſt.	03	30
At *Breſt*, before the *Baſs*, the River of *Bourdeaux*, within the Haven, and at *Barwick*, North--Eaſt by Eaſt, & South-Weſt by Weſt	03	45
In the *Bree-ſound*, *Bloy Baltimore*, E. N. E. and W. S. W.	04	30
Before *Breman*, and at *Blackney* in the Channel before *Bourdeaux*, and at *Briſtol*, Eaſt and Weſt	06	00
At *Briſtol*-Key, Eaſt by South and Weſt by North	06	45
At *Bridgwater*, E.S.E. and W. N. W.	07	30
Between *Beachy* and the the *Iſle of Wight*, South-Eaſt by Eaſt, and North-Weſt by Weſt	08	15
Bulleyn-deep, S. S. E. and N. N. W.	10	30

C.

	H.	M.
C.		
In the *Condado*, North and South	12	00
In the *Chamber* of *Rye*, North by East, and South by West	12	45
Without *Calice*, at *Corpus Chriſti* Point, before *Camfere*, and at *Camfere*, N. N. E. and S. S. W.	01	30
Between *Calice* and *Dover*, before *Conquet*, and at the *North Cape*, North-east, and South-weſt	03	00
At *Cork*, at *Calice*, and in the *Creek*, E. N. E. and W. S. W.	04	30
At *Caldy*, and in the Bay of *Carnarven*, East by North, and Weſt by South	05	15
At *Concalo*, East and Weſt	06	00
At Cape *Clear*, E. S. E. and W. N. W.	07	30
Without the *Caskets*, in the Channel, S. E. by East, and N. W. by W.	08	15
Between *Garnſey* and the *Caskets*, before *Cromer*, before the *Caskets* and *Garnſey*, at *Seven-Clefts*, and at *Cateneſs*, S. E. and N. W.	00	00
At the *Caskets*, and at *Chamberneſs*, S. E. by South, and N. W. by North	09	45
At *Cows*, in the *Foſs* of *Caen*, in *Calice*-Road, and in *Chamberneſs*-Road, S. S. E. and N. N. W.	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Cripple-Sand* and the *Creyl*, and at *Calſhot*, S. by East, and N. by Weſt.	11	15
D.		
At *Dover-Peer*, and before *Dunkirk*, North and South	12	00
At *Denby*, N. E. by N. and S. W. by S.	02	15
At *Dort*, N. E. and S. W.	03	00
At *Dungarvan*, E. N. E. and W. S. W.	04	30
At *Dartmouth*, East and Weſt	06	00
At *Dublin*, S. E. by East, and N. W. by W.	08	15
At *Dunbar*, S. E. and N. W.	09	00
At *Dungeneſs*, and *Dunoſe*, S. E. by S. and N. W. by N.	09	45
At *Dover*, and in the *Downs*, S. S. E. and N. N. W.	10	30
E.		
At *Embden*, before the *Elve*, before the *Eyder*, and before *Enchuyſen*, North and South	12	00
At *Edam*, N. N. E. and S. S. W.	00	03
Before the Eaſtern and Weſtern *Emes*, and at *Egmont*, S. E. and N. W.	09	00

F.	H.	M.
On the Coaſt of *Flanders*, North and South	12	00
At *Fluſhing*, North by Eaſt, and South by Weſt	1	45
Before the *Fen* in the Channel, N. N. E. and S. S. W.	01	30
Without *Fountnay*, N. E. by North, and S. W. by South	02	15
Without the Banks of *Flanders*, N. E. and S. W.	03	00
At *Flambrough* and *Bridlington*, E.N.E. and W.S.W.	04	30
At the *Fourn*, in *Foy*, at *Falmouth*, Eaſt by North, and Weſt by South	05	15
Between *Foy* and *Falmouth*, in the Channel, and at *Foulneſs*, Eaſt by South, and Weſt by North.	06	45
Before the Coaſt of *Friezland*, and the *Fly*, E.S.E. and W. N. W.	07	30
Without the *Fly*, S. E. by Eaſt, and N. W. by W.	08	15
At *Friez*, and *Fair Iſles*, N. W. and S. E.	09	00
In the *Frith*, and at the *South Foreland*, S. S. E. and N. N. W.	10	30
In *Fair-Iſle* Roads, and at the *North-foreland*, South by Eaſt, and North by Weſt	11	15

G.	H.	M.
In the Road of *Gibralter*, at *Graveling*, and before *Cherbrough*, North and South	12	00
Before *Gore*, and at *Gravesend*, N.N.E. and S.S.W.	01	30
At *Groy*, at *Gaſcoign*, and the Coaſt of *Gallicia*, N. E. and S. W.	03	00
At *Garnſey*, Eaſt by North, and Weſt by South	05	15
Between *Garnſey* and *Caſkets*, S. E. and N. W.	09	00
Thwart of *Garnſey* in the Channel, S. E. by South, and N.W. by North	09	45
In the *Chamber* and *Goreend*, South by Eaſt, and North by Weſt.	11	15

H.	H.	M.
Before the *Hever*, before *Horn*, and at *Hamton-Key*, North and South	12	00
Under *Holy-Iſland*, and at *Horn*, N. N. E. and S. S. W.	01	30
Before *Hartlepool*, N.E. and S. W.	03	00
At *Huntcliff-foot*, N. E. by Eaſt, and S. W. by Weſt	03	45
At *Humber*, Eaſt by North and Weſt by South	05	15
Before *Hambrough*, at *Hull*, at the *Holms*, and before *Humbers* Mouth, Eaſt and Weſt	06	00
At *Harlem*, and at *Homehead*, South-eaſt and North-weſt	09	00

At

	H.	M.
At St. *Hellens*, at *Harwich*, and without the Banks of *Harwich*, S.S.E. and N.N.W.	10	30
At *Harwich* within, S. by E. and North by West	11	15

I.

At *Jutland*-Islands North and South	12	00
On the West Coast of *Ireland*, N. E. and S. W.	03	00
In all the Havens on the South Coast of *Ireland*, East by North, and West by South	05	15

K.

Kentish Knock, North and South	12	00
Killiars, N.E. and S.W.	03	00
At *King-sail*, E. N. E. and W. S. W.	04	30
At *Kilduyn*, E. S. E. and W.N.W.	07	30
At *Kildive*, S. E. and N. W.	09	00

L.

At *Leith*, North and South.	12	00
At *Lisbon*, N.E. by North and S. W. by South.	02	15
At *London*, N. E. and S. W.	03	00
Thwart of *Londey*, and before *Lin*, East by North and West by South	05	15
At *Lin*, half-Tide, at *Londey*, East and West	06	00
At *Lime*, East by South, and West by North	06	45
At the *Lizard* by the Land, E. S. E. and W.N.W.	07	30
At *Lambey*, S. E. by East, and N. W. by West	08	15
At *Leystaff*, and thwart of it without the Banks, S. E. by South, and N. W. by North	09	45
In *Leystaff* Road, and at *Long-sand-head*, S. S. E. and N. N. W.	10	30

M.

Within the *Maes*, and at *Malden*, North by East, and South by West	12	45
Before the *Maes*, N. N. E. and S.S.W.	01	30
At the *Maes*, and before St. *Matthews* Point, N. E. by East, and S. W. by West	03	45
In *Mooshole*, at S. *Matthews*, and within *Mounts-Bay* E. N. E. and W. S. W.	04	30
In *Milford*, at *Moonless*, at St. *Maloes*, East by North, and West by South	05	15
Between *Mousehole* and *Falmouth*, and in *Milford* Haven, E.S.E. and W.N.W.	07	30
In St. *Magnes* Sound, and at *Machnels* Castle, S. E. by East, and N. W. by West	08	15

	H.	M.
At the *Isle of Man*, S. E. and N. W.	09	00
Before *Margaret*, South by East and North by West.	11	15

N.

At *Newport*, Half-Tide, North and South	12	00
At the West-end of the *Nower*, North by East, and South by West	12	45
Before *New-Castle*, and before the River of *Nantz*, N.E. and S. W.	03	00
At *New-Castle*, East by North, and W. by S.	05	15
Before S. *Nicholas*, E. by S. and W. by N.	06	45
At the *Needles*, at the *Isle of Wight*, S. E. by East, and N. W. by West	08	15
All the Coast of *Normandy* and *Picardy*, S. S. E. and N. N. W.	10	30
Between the *Naze*, and *Warhead* of *Lower*, South by East, and N. by W.	11	15

O.

At *Orkneſs*, N. E. and S. W.	03	00
At *Orkney*, S. E. and N. W.	09	00
At *Orfordneſs*, S. E. by South, and North-West by North	09	45
At *Orfordneſs* without the Banks, and between *Orford* and *Orwel-waves*, S. S.E. and N. N. W.	10	30
At *Orfordneſs* within the Sands, South by East, and North by West.	11	15

P.

At *Portſmouth*, Half-Tide, North and South	12	00
At the *Penns*, *Porthus*, and *Picton*, N. E. and S. W.	03	00
On the Coaſt of *Portugal*, N. E. by East, and S. W. by West	03	45
In *Plymouth*, and before St. *Paul's*, East by North, and West by South	05	15
At St. *Paul's* in the Haven, East and West	06	00
Before *Podeſſinks*, East by South, and West by North	06	45
Thwart of *Plymouth*, E.S.E. and W. N. W.	07	30
At the *Race* of *Portland*. S. E. and N.W.	09	00

Q.

At *Quinborough*, North and South	12	00

R.

At *Rocheſter*, North by East, and South by West	12	45

At

	H.	M.
At *Ramkins*, N. N. E. and S. S. W.	10	30
At *Rotterdam*, in *Robin-Hood*'s Bay, and from the *Race* to the *Pole-head*, N. E. and S. W.	03	00
At *Rouen*, and before *Rochel*, N. E. by E. and S. W. by W.	03	45
In *Ramsey*, East by North and West by South	05	15
In *Russia*, East by South, and West by North.	06	45

S.

In the *Sleeve*, between *Ushant* and *Silly*, at the *Shooe*, at the *Spit*, at *South-Hampton*, and along the *Swin*, Noth and South	12	00
Upon the Coast of *Spain*, and in *Shotland*, N. E. and S. W.	03	00
At *Silly*, and in the *Sound*, at *Staples*, N. E. by East, and S. W. by West	03	45
Before *Scarborough*, at *Sept. Isles*, without the Haven in the Broad *Sound*, E. N. E. and W. S. W.	04	30
At the Mouth of *Severn*, between *Silly* and the *Lizard*, at the *Spurn*, East by North, and W. by S.	05	15
Without *Silly*, in the Channel, and at *Salcomb*, East and West.	06	00
At *Sedmouth*, and at the *Start*, East by South, and West by North	06	45
Off the *Start*, in the Channel, E. S. E. and W. N. W.	07	30
Within the *Seyn*, before *Schelbalgh*, and at *Seven Cliffs*, S. E. and N. W.	09	00
At *Shoram*, S. E. by S. and N. W. by N.	09	45
At *Seyn-head*, S. S. E. and N. N. W.	10	30

T.

Within *Terveer*, N. by E. and S. by W.	12	43
Before *Terveer*, before the River of *Thames*, and at *Tinmouth*, N. N. E. and S. S. W.	10	30
Before the *Tees*, and before the Bay of *Tinmouth*, N. E. and S. W.	03	00
At the Clefts of the *Tessel*, E. N. E. and W. S. W.	04	30
In *Torbay*, and before the *Tessel*, East and West	06	00
In the Road of the *Tessel*, E. S. E. and W. N. W.	07	30
At *Tergou*, S. E. by S. and N. W. by N.	09	45

V.

Before *Vreck*, North and South	12	00

At

	H.	M.
At *Use*, North-east and South-west	03	00
Between *Ushant* and the Main, N. E. by East, and S.W. by West	03	45
In the *Vourd*, at the Bay within *Ushant*, E. N. E. and W. S. W.	04	30
Without *Ushant*, East and West.	06	00

W.

At *Winchelsey*, North by East, and South by West	12	45
At the *Weilings*, and from the West-end of the *Wight*, N.N.E. and S.S.W.	01	30
Before the *Weilings*, N.E. by North, and S. W. by South	02	15
In the Sea of *Wales* and *Severn*, E.N.E. and W.S.W.	04	30
In *Wales*, East by North, and West by South	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, East and West	06	00
At *Weymouth* Key, East by South, and West by North	06	45
At the *Ness* by *Wieringhen*, and at *Winterton*, E. S. E. and W.N.W.	07	30
Thwart of the *Isle of Wight* in the Channel, all within the *Isle of Wight*, between the *Isle of Wight*, and *Beachy* by the Shore, S. E. by East, and N. W. by West	08	15
At the East-end of the *Wight*, and on *Wieringhen*-Flats, S. E. and N. W.	09	00

Y.

Before *Yarmouth*, N. N. E. and S. S. W.	01	30
At *Youghall*, E. N. E. and W. S. W.	04	30
At *Yarmouth*, S. E. by East and N. W. by West	08	15
In *Yarmouth* Road, and in *Yarmouth* Haven, S. S. E. and N. N. W.	10	30

Z.

On the Coast of *Zealand*, N. N. E. and S. S. W.	01	30
In the *Zierick Sea*, N. E. and S. W.	03	00

THE foregoing Table ſhews the time of Full-Sea, at the ſeveral places therein mentioned, upon the Full and Change days of the Moon, which for rhe more ready uſe is put in Alphabetical order.

Example.

Admit the time of Full-Sea at *London*, upon the Full and Change days be required.

Look in the Table under the Letter (L) it is found to flow at *London* North-eaſt and South weſt, (as is vulgarly expreſſed) that is, When it is Full-Sea at *London* upon the Full and Change days, the Moon will be upon the North-eaſt and South-weſt Points of the Compaſs, which, (as the ſaid Table ſhews) is at 3 hours.

The Uſe of this, together with the Moon's Southing, to find the time of Full-Sea at any time at any of the ſaid places, ſhall be ſhown below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4, and divide the Product by 5, and the Quotient of the Diviſion is the time of Southing.

Note, If the Moon's Age exceed 15, reject the ſaid 15, and take the Remainder, with which proceed inſtead of the Moon's Age

Example.

Suppoſe the time of the Moon's Southing be required on the 9*th* of *June* 1676. The Moon's Age will be found to be 19 days; rejecting 15, the Remainder is 4; which multiplied by 4, makes 16, which divided by 5, gives in the Quotient 3 $\frac{1}{5}$, or 3 hours 12 minutes, which is the time of the Moon's Southing, which was required.

Note, Every 1 that remains after Diviſion is 12 Minutes.

I ſhall here add a Table of the Moon's Southing to every day of her Age.

The

The Table.

Moon's Age.	Southing. H.	M.
01 —— 16	00 ——	48
02 —— 17	1 ——	36
03 —— 18	2 ——	24
04 —— 19	3 ——	12
05 —— 20	4 ——	00
06 —— 21	4 ——	48
07 —— 22	5 ——	36
08 —— 23	6 ——	24
09 —— 24	7 ——	12
10 —— 25	8 ——	00
11 —— 26	8 ——	48
12 —— 27	9 ——	36
13 —— 28	10 ——	24
14 —— 29	11 ——	12
15 —— 30	12 ——	00

The Explanation and Uſe of the Table.

The firſt and ſecond Columns ſhew the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old, and her Southing required.

In the firſt Column, under the Title *Moon's Age* ſtands 9; over againſt it, in the laſt Column, is 7 Hours 12 Minutes, the time of the Southing required.

Note alſo, the ſame Southing ſerves for 24 Days old, as the Table ſhews.

Thus having got the Moon's Southing, proceed to find the time of Full-Sea as follows.

Suppoſe the Moon being 9 Days old, the time of Full-Sea in the *Downs* required.

By the foregoing Table it appears that a N. N. W. and S. S. E. Moon makes Full-Sea upon the Full and Change Days, which (as the ſaid Table ſhews) is 10 Hours 30 Minutes; to which adding the Moon's Southing at 9 Days old, (*viz.* 7 Hours 12 Minutes, it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes, rejecting 12 Hours.

But to be more exact, uſe the following Table and Directions.

Having found the time of Full-Sea upon the Full and Change Days, by the preceeding Table for that purpoſe, enter this Table with the Moon's Age; againſt which in the laſt Column are the Hours and Minutes to be added for the time of Full-Sea deſired.

Example.

Suppoſe, as before, the Moon being 9 Days old, and the time of Full-Sea in the *Downs* is required.

A N. N. W. and S. S. E. Moon making Full-Sea upon the Full and Change Days, which is 10 hours 30 minutes; which being found, enter this Table with the Moon's Age 9 Days, againſt which ſtands 5 Hours 50 Minutes; which added to 10 Hours 30 Minutes, makes 16 Hours 20 Minutes, or 4 Hours 20 Minutes, rejecting 12 Hours.

The Tide-Table.

Moon's Age.	Tide. H.	M.
01——16	00——	43
02——17	01——	20
03——18	01——	52
04——19	02——	22
05——20	02——	52
06——21	03——	26
07——22	04——	07
08——23	04——	55
09——24	05——	50
10——25	06——	53
11——26	07——	59
12——27	09——	04
13——28	10——	08
14——29	11——	05
15——30	00——	00

Here follows

A New and Exact KALENDAR

OF

The Sun's Place and Declination to every Day of the Year, for the Firſt, Second, Third, and Leap-Years, diligently corrected. Likewiſe the Sun's Riſing, whereby may be found the time of Setting, and Length of the Day and Night: Together with the Southing of the principal fixed Stars at Mid-night.

Month days.	Week days.	Remarkable days & souething of ſtars at midnight.	First Year. 1685. 1689. ☉ pla. D. M.	☉ dec. D. M.	Second Year. 1686. 1690. ☉ pla. D. M.	☉ dec. D. M.	Third Year. 1687. 1691. ☉ pla. D. M.	☉ dec. D. M.	Leap-Year. 1688. 1692. ☉ pla. D. M.	☉ dec. D. M.
			♑.	South.	♑.	South.	♑.	South.	♑.	South.
1	A	Circumcis.	22 02	21 41	21 47	21 44	21 32	21 46	21 17	21 48
2	B	Sun riſe 8.	23 03	21 31	22 48	21 33	22 33	21 36	22 19	21 38
3	C		24 04	21 21	23 49	21 23	23 35	21 26	23 20	21 28
4	D		25 05	21 10	24 51	21 13	24 36	21 15	24 21	21 18
5	E		26 07	20 59	25 52	21 01	25 37	21 04	25 22	21 07
6	F	Epiphany.	27 08	20 47	26 53	20 50	26 38	20 53	26 23	20 55
7	G		28 09	20 35	27 54	20 38	27 39	20 41	27 24	20 44
8	A		29 10	20 23	28 55	20 26	28 40	20 29	28 25	20 32
9	B	*Sol* in *Aqua*	♒. 11	20 10	29 56	20 13	29 41	20 16	29 26	20 19
10	C		01 12	19 56	♒. 57	20 00	♒. 42	20 03	♒. 27	20 06
11	D		02 13	19 43	01 58	19 46	01 43	19 15	01 29	19 53
12	E	Sun r. 7.45	03 14	19 29	02 59	19 32	02 44	19 36	02 30	19 39
13	F		04 15	19 15	04 00	19 18	03 45	19 22	03 31	19 25
14	G		05 16	19 00	05 01	19 04	04 46	19 07	04 32	19 11
15	A		06 17	18 45	06 02	18 49	05 47	18 52	05 33	18 56
16	B		07 18	18 30	07 03	18 33	06 48	18 37	06 34	18 41
17	C		08 19	18 14	08 04	18 18	07 49	18 22	07 35	18 25
18	D		09 20	17 58	09 05	18 02	08 50	18 06	08 35	18 10
19	E		10 21	17 42	10 06	17 46	09 51	17 50	09 36	17 54
20	F		11 22	17 25	11 07	17 29	10 52	17 33	10 37	17 37
21	G		12 23	17 08	12 08	17 12	11 53	17 16	11 38	17 20
22	A	Sun r. 7.30	13 24	16 51	13 08	16 55	12 54	16 59	12 39	17 03
23	B		14 24	16 33	14 09	16 38	13 55	16 42	13 40	16 46
24	C	*Hydras* heart	15 25	16 15	15 10	16 20	14 55	16 24	14 41	16 30
25	D	Co. S. *Paul*	16 26	15 57	16 11	16 02	15 56	16 06	15 41	16 11
26	E		17 26	15 39	17 12	15 43	16 57	15 48	16 42	15 52
27	F		18 27	15 20	18 12	15 25	17 58	15 29	17 43	15 34
28	G		19 28	15 01	19 13	15 06	18 58	15 11	18 44	15 15
29	A		20 28	14 42	20 14	14 47	19 59	14 52	19 44	14 56
30	B	K. *Charles* M.	21 29	14 23	21 14	14 28	21 00	14 32	20 45	14 37
31	C		22 30	14 03	22 15	14 08	22 00	14 13	21 46	14 18

Month days.	Week days.	Remarkable days & southing of stars at midnight.	First Year. 1685. ☉ pla. D. M.	☉ dec. D. M.	1689. ☉ pla. D. M.	☉ dec. D. M.	Second Year. 1686. ☉ pla. D. M.	☉ dec. D. M.	1690. ☉ pla. D. M.	☉ dec. D. M.	Third Year. 1687. ☉ pla. D. M.	☉ dec. D. M.	1691. ☉ pla. D. M.	☉ dec. D. M.	Leap-Year. 1688. ☉ pla. D. M.	☉ dec. D. M.	1692. ☉ pla. D. M.	☉ dec. D. M.
			♒.	South.			♒.	South.			♒.	South.			♒.	South.		
1	D		23 30	13 43	23 16	13 48	23 01	13 53	22 46	13 58								
2	E	Purif *Mary*	24 31	13 23	24 16	13 28	24 01	13 33	23 47	13 38								
3	F	Lions heart.	25 31	13 03	25 17	13 08	25 02	13 13	24 47	13 18								
4	G		26 32	12 43	26 17	12 48	26 02	12 53	25 48	12 58								
5	A		27 32	12 22	27 18	12 27	27 03	12 32	26 48	12 37								
6	B	Lions Neck.	28 33	12 01	28 18	12 06	28 03	12 10	27 49	12 16								
7	C	Sun r. 7.1.	29 33	11 40	29 19	11 45	29 04	11 50	28 49	11 55								
8	D	*Sol* in *Pisces*.	♓. 34	11 18	♓. 19	11 24	♓. 04	11 29	29 50	11 34								
9	E		01 34	10 57	01 19	11 02	01 05	11 08	♓. 50	11 13								
10	F		02 34	10 35	02 20	10 41	02 05	10 46	01 50	10 51								
11	G		03 35	10 14	03 20	10 19	03 05	10 24	02 51	10 30								
12	A		04 35	09 52	04 20	09 57	04 06	10 02	03 51	10 08								
13	B		05 35	09 30	05 20	09 35	05 06	09 40	04 51	09 46								
14	C	*Valentine.*	06 35	09 07	06 21	09 13	06 06	09 18	05 51	09 24								
15	D	Sun r. 6.46	07 35	08 45	07 21	08 51	07 06	08 56	06 52	09 01								
16	E	Lower of	08 36	08 23	08 21	08 28	08 06	08 34	07 52	08 39								
17	F	two foremost	09 36	08 00	09 21	08 05	09 07	08 11	08 52	08 16								
18	G	in □ of great	10 36	07 37	10 21	07 43	10 07	07 48	09 52	07 54								
19	A	Bear.	11 36	07 14	11 21	07 20	11 07	07 26	10 52	07 31								
20	B		12 36	06 51	12 21	06 57	12 07	07 03	11 52	07 08								
21	C		13 36	06 28	13 21	06 34	13 07	06 40	12 52	06 45								
22	D		14 36	06 05	14 21	06 11	14 07	06 17	13 52	06 22								
23	E	Sun r. 6.30	15 36	05 42	15 21	05 48	15 07	05 53	14 52	05 56								
24	F		16 36	05 19	16 21	05 25	16 07	05 30	15 52	05 30								
25	G	S. *Matthias*	17 35	04 56	17 21	05 01	17 06	05 07	16 52	05 13								
26	A		18 35	04 32	18 21	04 38	18 06	04 43	17 52	04 49								
27	B		19 35	04 09	19 21	04 14	19 06	04 20	18 52	04 26								
28	C		20 35	03 45	20 20	03 51	20 06	03 57	19 51	04 02								
29	D		When it is Leap-Year, *February* hath 29 days.												20 51	03 39		

Month days.	Week days.	Remarkable days & southing of ſtars at midnight.	First Year. 1685. ☉ pla. D. M.	1689. ☉ dec. D. M.	Second Year. 1686. ☉ pla. D. M.	1690. ☉ dec. D. M.	Third Year. 1687. ☉ pla. D. M.	1691. ☉ dec. D. M.	Leap-Year, 1688. ☉ pla. D. M.	1692. ☉ dec. D. M.
			♓.	South.	♓.	South.	♓.	South.	♓.	South.
1	D	*David.*	21 34	03 22	21 20	03 27	21 06	03 33	21 51	03 15
2	E	Lions Tail.	22 34	02 58	22 20	03 04	22 05	03 09	22 50	02 51
3	F	Lower of the	23 39	02 34	23 19	02 40	23 05	02 46	23 50	02 28
4	G	two latter in □ of great	24 33	02 11	24 19	02 16	24 05	02 22	24 50	02 04
5	A	Bear.	25 33	01 47	25 19	01 53	25 04	01 58	25 49	01 41
6	B		26 33	01 23	26 18	01 29	26 04	01 35	26 49	01 17
7	C		27 32	01 00	27 18	01 05	27 03	01 11	27 48	00 53
8	D	Sun r. 6. 4.	28 32	00 36	28 17	00 42	28 03	00 47	28 98	00 29
9	E	Upper of	29 31	00 12	29 17	00 18	29 02	00 24	29 47	00 06
10	F	two latter in □ of great	♈. 30	*Nor.* 12	♈. 16	*Nor.* 06	♈. 02	00 00	♈. 47	*Nor.* 18
11	G	Bear.	01 30	00 35	01 15	00 29	01 01	*Nor.* 24	01 46	00 42
12	A	*Sol* in *Aries.*	02 29	00 59	02 15	00 53	02 00	00 47	02 45	01 05
13	B		03 28	01 22	03 14	01 17	03 00	01 11	03 44	01 29
14	C		04 28	01 46	04 13	01 40	03 59	01 35	04 44	01 52
15	D		05 27	02 10	05 12	02 04	04 58	01 58	05 43	02 16
16	E		06 26	02 33	06 12	02 27	05 57	02 22	06 42	02 39
17	F		07 25	02 56	07 11	02 51	06 56	02 45	07 41	03 03
18	G	Sun r. 5. 44	08 24	03 20	08 10	03 14	07 56	03 09	08 40	03 26
19	A		09 23	03 43	09 09	03 38	08 55	03 32	09 39	03 49
20	B		10 22	04 06	10 08	04 01	09 54	03 55	10 38	04 13
21	C	Laſt but two	11 21	04 30	11 07	04 24	10 53	04 18	11 37	04 36
22	D	in gr. Bears Tail.	12 20	04 53	12 06	04 47	11 52	04 42	12 3[illegible]	04 59
23	E		13 19	05 16	13 05	05 10	12 51	05 05	13 3[illegible]	05 22
24	F		14 18	05 39	14 04	05 33	13 50	05 28	14 34	05 45
25	G	An. *Mary*	15 17	06 01	15 03	05 56	14 49	05 50	15 33	06 08
26	A	Sun r. 5. 28	16 16	06 24	16 02	06 19	15 47	06 13	16 3[illegible]	06 30
27	B		17 15	06 47	17 00	06 41	16 46	06 36	17 3	06 53
28	C		18 14	07 09	17 59	07 04	17 45	06 58	18 3[illegible]	07 14
29	D	Virg. Spike	19 12	07 32	18 58	07 26	18 44	07 21	19 2	07 38
30	E	Laſt but one in gr. Bears	20 11	27 54	19 57	07 49	19 43	07 43	20 27	08 00
31	F	Tail.	21 10	08 16	20 55	08 11	20 41	08 05	21 2[illegible]	08 22

Month days.	Week days.	Remarkable days & southing of stars at midnight.	First Year. 1685. ☉ pla.	First Year. 1685. ☉ dec.	Second Year. 1686. ☉ pla.	Second Year. 1690. ☉ dec.	Third Year. 1687. ☉ pla.	Third Year. 1691. ☉ dec.	Leap-Year. 1688. ☉ pla.	Leap-Year. 1692. ☉ dec.
			D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
			♈.	North.	♈.	North.	♈.	North.	♈.	North.
01	G	Sun r. 5.15	22 08	08 38	21 54	08 33	21 40	08 27	22 24	08 44
02	A		23 07	09 00	22 53	08 55	22 38	08 49	23 23	09 06
03	B		24 05	09 22	23 51	09 16	23 37	09 11	24 21	09 27
04	C	Last in great Bears Tail.	25 04	09 43	24 50	09 38	24 36	09 33	25 20	09 49
05	D		26 02	10 04	25 48	09 59	25 34	9 54	26 18	10 10
06	E		27 01	10 26	26 47	10 21	26 33	10 15	27 17	10 31
07	F		27 59	10 47	27 45	10 42	27 31	10 37	28 15	10 52
08	G		28 58	11 08	28 44	11 03	28 25	10 57	29 14	11 13
09	A	Sun r. 5.1.	29 56	11 28	29 42	11 23	29 28	11 18	♉. 12	11 34
10	B	*Sol* in *Taur.*	♉. 55	11 49	♉. 40	11 44	♉. 26	11 39	01 10	11 54
11	C	Dragons tail	01 53	12 09	01 39	12 05	01 25	11 59	02 09	12 15
12	D	Arcturus.	02 51	12 29	02 37	12 24	02 23	12 19	03 07	12 35
13	E		03 49	12 49	03 35	12 44	03 21	12 39	04 05	12 54
14	F		04 48	13 09	04 33	13 04	04 19	12 56	05 03	13 14
15	G		05 46	13 28	05 32	13 24	05 18	13 19	06 02	13 34
16	A		06 44	13 47	06 30	13 43	06 16	13 38	07 00	13 53
17	B		07 42	14 07	07 28	14 02	07 14	13 57	07 58	14 12
18	C		08 40	14 25	08 26	14 21	08 12	14 16	08 56	14 30
19	D	Sun r. 4.45	09 38	14 44	09 24	14 39	09 10	14 35	09 54	14 49
20	E	Southermost Scale in Lib.	10 36	15 02	10 22	14 58	10 08	14 53	10 52	15 07
21	F		11 34	15 20	11 20	15 91	11 06	15 12	11 50	15 25
22	G		12 32	15 38	12 18	15 34	12 04	15 30	12 48	15 43
23	A		13 30	16 56	13 16	15 52	13 02	15 47	13 46	16 00
24	B		14 28	16 13	14 14	16 09	14 00	16 05	14 44	16 18
25	C	*Mark* Eva.	15 26	16 30	15 12	16 26	14 58	16 22	15 42	16 35
26	D	Upper of the	16 24	16 47	16 10	16 43	15 56	16 39	16 40	16 51
27	E	two foremost in □ of the	17 22	17 03	17 08	16 59	16 54	16 55	17 38	17 08
28	F	little Bear.	18 20	17 20	18 06	17 16	17 52	17 12	18 36	17 24
29	G	Northermost Scale of Lib.	19 18	17 36	19 04	17 32	18 50	17 28	19 33	17 40
30	A	Sun r. 4.24	20 15	17 51	20 01	17 47	19 47	17 44	20 31	17 55

Month days.	Week days.	Remarkable days & ſouthing of ſtars at midnight	First Year. 1685. 1689. ☉ pla.	☉ dec.	Second Year. 1686. 1690. ☉ pla.	☉ dec.	Third Year. 1687. 1691. ☉ pla.	☉ dec.	Leap-Year. 1688. 1692. ☉ pla.	☉ dec.
			D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
			♉.	North.	♉.	North.	♉.	North.	♉.	North.
1	B	*Phil.* & *Ja.*	21 13	18 07	20 59	18 03	20 45	17 59	21 29	18 11
2	C		22 11	18 22	21 57	18 18	21 43	18 14	22 27	18 26
3	D	Brighteſt in	23 09	18 36	22 55	18 33	22 41	18 29	23 24	18 40
4	E	the Crown. Brighteſt in	24 06	18 51	23 52	18 47	23 38	18 44	24 22	18 55
5	F	Serp. Neck.	25 04	19 05	24 50	19 01	24 36	18 58	25 20	19 09
6	G	Sun r. 4. 15	26 02	19 19	25 48	19 15	25 34	19 12	26 17	19 22
7	A		27 59	19 32	26 45	19 29	26 31	19 26	27 15	19 36
8	B		27 57	19 45	27 43	19 42	27 29	19 39	28 13	19 49
9	C	Scorpions	28 54	19 58	28 40	19 55	28 26	19 52	29 10	20 02
10	D	Forehead.	29 52	20 11	29 38	20 08	29 24	20 05	♊. 08	20 14
11	E	*Sol* in *Gem.*	♊. 49	20 23	♊. 36	20 20	♊. 22	20 17	01 05	20 26
12	F		01 47	20 34	01 33	20 32	01 19	20 29	02 03	20 38
13	G		02 44	20 46	02 31	20 43	02 17	20 40	03 00	20 49
14	A	Scorpions	03 42	20 57	03 28	20 54	03 14	20 52	03 58	21 00
15	B	Heart.	04 39	21 08	04 26	21 05	04 12	21 03	04 55	21 11
16	C		05 37	21 18	05 23	21 16	05 09	21 13	05 53	21 21
17	D	Sun riſe 4.	06 34	21 28	06 20	21 26	06 07	21 23	06 50	21 31
18	E		07 32	21 38	07 18	21 35	07 04	21 33	07 47	21 40
19	F		08 29	21 47	08 15	21 45	08 01	21 42	08 45	21 49
20	G		09 27	21 56	09 13	21 54	08 59	21 51	09 42	21 58
21	A		10 24	22 04	10 10	22 02	09 56	22 00	10 40	22 07
22	B		11 21	22 12	11 07	22 10	10 53	22 08	11 37	22 14
23	C		12 19	22 20	12 05	22 18	11 51	22 16	12 34	22 22
24	D		13 16	22 27	13 02	22 26	12 48	22 24	13 32	22 29
25	E		14 13	22 34	13 59	22 33	13 45	22 31	14 29	22 36
26	F		15 11	22 41	14 57	22 39	14 43	22 38	15 26	22 43
27	G		16 08	22 47	15 54	22 46	15 40	22 44	16 24	22 49
28	A		17 05	22 53	16 51	22 52	16 37	22 50	17 21	22 54
29	B	K. *Charles* 2d	18 02	22 58	17 48	22 57	17 35	22 56	18 18	22 59
30	C	Nat. & Ret.	19 00	23 03	18 46	23 02	18 32	23 01	19 15	23 04
31	D	Sun r. 3. 52	19 56	23 08	19 43	23 07	19 29	23 06	20 13	23 09

Month days.	Week days.	Remarkable days, & southing of stars at Midnight.	First Year. 1685. ☉ pla. D. M.	☉ dec. D. M.	Second Year. 1686. ☉ pla. D. M.	☉ dec. D. M.	Third Year. 1687. ☉ pla. D. M.	☉ dec D. M.	Leap-Year. 1688. ☉ pla. D. M.	☉ dec. D. M.
			♊.	North.	♊.	North.	♊.	North.	♊.	North.
01	E		20 54	23 11	20 46	23 10	20 20	23 09	21 10	23 12
02	F		21 51	23 15	21 37	23 14	21 24	23 13	22 07	23 16
03	G	Fight with	22 49	23 18	22 35	23 17	22 21	23 16	23 04	23 19
04	A	*Dutch* 1652. 1665	23 46	23 21	23 32	23 20	23 18	23 20	24 01	23 22
05	B		24 43	23 23	24 29	23 23	24 15	23 22	24 59	23 24
06	C		25 40	23 26	25 26	23 25	25 12	23 25	25 56	23 26
07	D		26 37	23 27	26 23	23 27	26 10	23 27	26 53	23 28
08	E		27 34	23 29	27 21	23 28	27 07	23 28	27 50	23 29
09	F		28 32	23 29	28 18	23 29	28 04	23 29	28 47	23 30
10	G	Sun r. 3.48	29 29	23 30	29 15	23 30	29 01	23 30	29 45	23 30
11	A	*Sol* in *Cancer*	♋. 26	23 30	♋. 12	23 30	29 58	23 30	♋. 42	23 30
12	B		01 23	23 30	01 09	23 30	♋. 56	23 30	01 39	23 29
13	C		02 20	23 29	02 06	23 29	01 53	23 29	02 36	23 28
14	D		03 18	23 28	03 04	23 28	02 50	23 28	03 33	23 27
15	E		04 15	23 26	04 01	23 26	03 47	23 27	04 30	23 25
16	F		05 12	23 24	04 58	23 25	04 44	23 25	05 27	23 23
17	G	Brightest in	06 09	23 22	05 55	23 22	05 41	23 23	06 25	23 21
18	A	the Harp.	07 06	23 19	06 52	23 19	06 38	23 20	07 22	23 18
19	B		08 03	23 16	07 49	23 16	07 36	23 17	08 19	23 15
20	C		09 00	23 12	08 47	23 13	08 33	23 14	09 16	23 11
21	D	Sun r. 3.50	09 58	23 08	09 44	23 09	09 30	23 10	10 13	23 07
22	E		10 55	23 03	10 41	23 04	10 27	23 06	11 10	23 02
23	F		11 52	22 58	11 38	23 00	11 24	23 01	12 08	22 57
24	G	*John* Bap.	12 49	22 53	12 35	22 54	12 21	22 56	13 05	22 52
25	A		13 46	22 48	13 32	22 49	13 19	22 50	14 02	22 46
26	B		14 43	22 41	14 30	22 43	14 16	22 44	14 59	22 40
27	C		15 41	22 35	15 27	22 37	15 13	22 38	15 56	22 33
28	D		16 38	22 28	16 24	22 30	16 10	22 32	16 53	22 26
29	E	*Peter* Ap.	17 35	22 21	17 21	22 23	17 07	22 25	17 51	22 19
30	F		18 32	22 13	18 18	22 15	18 04	22 17	18 48	22 11

Month days.	Week days.	Remarkable days & southing of Star at midnight.	First Year. 1685. 1689. ☉ pla. D. M.	☉ dec. D. M.	Second Year. 1686. 1690. ☉ pla. D. M.	☉ dec. D. M.	Third Year. 1687. 1691. ☉ pla D. M.	☉ dec. D. M.	Leap Year. 1688. 1692. ☉ pla. D. M.	☉ dec. D. M.
			♋.	North.	♋.	North.	♋.	North.	♋.	North.
1	G	Sun r.3.57	19 29	22 04	19 15	22 06	19 02	22 08	19 45	22 02
2	A		20 26	21 56	20 13	21 58	19 59	22 00	20 42	21 54
3	B		21 24	21 47	21 10	21 49	20 56	22 52	21 39	21 45
4	C	Brightest between the	22 21	21 38	22 07	21 40	21 53	21 43	22 37	21 36
5	D	Eagles	23 18	21 29	23 04	21 31	22 50	21 33	23 34	21 26
6	E	Shoulders.	24 15	21 19	24 02	21 21	23 48	21 24	24 31	21 16
7	F		25 13	21 09	24 59	21 11	24 45	21 14	25 28	21 06
8	G		26 10	20 58	25 56	21 01	25 42	21 03	26 26	20 55
9	A		27 07	20 47	26 53	20 50	26 39	20 52	27 23	20 44
10	B		28 04	20 36	27 51	20 39	27 37	20 41	28 20	20 33
11	C		29 02	20 24	28 48	20 27	28 34	20 30	29 17	20 21
12	D		29 59	20 12	29 45	20 15	29 31	20 18	♌. 15	20 09
13	E	*Sol* in *Leo.*	♌. 56	20 00	♌. 42	20 03	♌. 29	20 06	01 12	19 56
14	F		01 54	19 47	01 40	19 50	01 26	19 53	02 09	19 44
15	G		02 51	19 34	02 37	19 37	02 23	19 41	03 07	19 31
16	A		03 48	19 21	03 34	19 24	03 21	19 27	04 04	19 17
17	B	Sun r.4.15	04 46	19 07	04 32	19 11	04 18	19 14	05 01	19 03
18	C	Swans Tail.	05 43	18 53	05 29	18 57	05 15	19 00	05 59	18 49
19	D	Dog days	06 40	18 39	06 27	18 43	06 13	18 46	06 56	18 35
20	E	begin.	07 38	18 24	07 24	18 28	07 10	18 32	07 54	18 20
21	F		08 35	18 10	08 21	18 13	08 08	18 17	08 51	18 06
22	G		09 33	17 55	09 19	17 58	09 05	18 02	09 48	17 50
23	A		10 30	17 39	10 16	17 43	10 02	17 47	10 46	17 35
24	B		11 28	17 23	11 14	17 27	11 00	17 31	11 43	17 19
25	C	*James* Ap.	12 25	17 07	12 11	17 11	11 57	17 15	12 41	17 03
26	D	Sun r.4 30	13 24	16 51	13 09	16 54	12 55	16 59	13 38	16 46
27	E		14 20	16 34	14 06	16 38	13 52	16 42	14 36	16 30
28	F		15 18	16 18	15 04	16 22	14 50	16 26	15 34	16 13
29	G		16 15	16 00	16 01	16 05	15 48	16 09	16 31	15 56
30	A		17 13	15 43	16 59	15 47	16 45	15 52	17 29	15 38
31	B		18 11	15 26	17 57	15 30	17 43	15 34	18 26	15 21

Month days.	Week days.	Remarkable days & southing of stars at midnight.	First Year. 1685. 1689. ☉ pla.		☉ dec.		Second Year. 1686. 1690. ☉ pla.		☉ dec.		Third Year. 1687. 1691. ☉ pla.		☉ dec.		Leap Year. 1688. 1692. ☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♌		North.		♌		North.		♌		North.		♌		North.	
1	C		19	08	15	08	18	54	15	12	18	40	15	16	19	24	15	03
2	D		20	06	14	49	19	52	14	54	19	38	14	58	20	22	14	44
3	E	Pegasus Mouth.	21	04	14	31	20	50	14	36	20	36	14	40	21	19	14	26
4	F	Sun r. 4.45	22	01	14	12	21	47	14	17	21	33	14	22	22	17	14	07
5	G		22	59	13	54	22	45	13	58	22	31	14	03	23	15	13	48
6	A		23	57	13	35	23	43	13	39	23	29	13	44	24	13	13	29
7	B		24	55	13	15	24	41	13	20	24	27	13	25	25	10	13	10
8	C		25	52	12	56	25	38	13	01	25	24	13	05	26	08	12	51
9	D		26	50	12	36	26	36	12	41	26	22	12	46	27	06	12	31
10	E		27	48	12	16	27	34	12	21	27	20	12	26	28	04	12	11
11	F		28	46	11	56	28	32	12	01	28	18	12	06	29	02	11	51
12	G		29	44	11	36	29	30	11	41	29	16	11	46	30	00	11	30
13	A	*Sol* in *Virg.*	♍	42	11	16	♍	28	11	21	♍	14	11	26	♍	58	11	10
14	B	Sun r. 5.2.	01	40	10	55	01	26	11	00	01	12	11	05	01	56	10	40
15	C		02	38	10	34	02	24	10	39	02	10	10	44	02	54	10	28
16	D		03	36	10	13	03	22	10	18	03	08	10	23	03	53	10	07
17	E		04	34	09	52	04	20	09	57	04	06	10	02	04	50	09	46
18	F		05	32	09	31	05	18	09	36	05	04	09	14	05	48	09	25
19	G		06	30	09	09	06	16	09	15	06	02	09	20	06	46	09	03
20	A		07	28	08	48	07	14	08	53	07	00	08	58	07	44	08	42
21	B	Formahant.	08	27	08	26	08	12	08	31	07	58	08	37	08	42	08	20
22	C		09	25	08	04	09	11	08	09	08	57	08	15	09	41	07	58
23	D		10	23	07	42	10	09	07	47	09	55	07	53	10	39	07	36
24	E	*Bartbol.* Ap	11	21	07	20	11	07	07	25	10	53	07	31	11	37	07	14
25	F	First in Pegasus Wing,	12	19	06	58	12	05	07	03	11	51	07	09	12	35	06	52
26	G	and begin.	13	18	06	35	13	04	06	41	12	50	06	46	13	34	06	29
27	A	of his Leg.	14	16	06	13	14	02	06	18	13	48	06	24	14	32	06	07
28	B	Dog days end.	15	15	05	50	15	00	05	56	14	46	06	01	15	30	05	44
29	C	Sun r. 5.32	16	13	05	28	15	59	05	33	15	45	05	39	16	29	05	22
30	D		17	11	05	05	16	57	05	10	16	43	05	16	17	27	04	59
31	E		18	10	04	42	17	56	04	48	17	42	04	53	18	26	04	36

Month days.	Week days.	Remarkable days & southing of stars at midnight.	First Year. 1685. 1689. ☉ pla.		☉ dec.		Second Year. 1686. 1690. ☉ pla.		☉ dec.		Third Year. 1687. 1691. ☉ pla.		☉ dec.		Leap-Year. 1688. 1692. ☽ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♍.		North.		♍.		North.		♍.		North.		♍.		North.	
1	F	Sun r. 5.37	19	08	04	19	18	54	04	25	18	40	04	30	19	24	04	1
2	G	*Lon.* burnt 66	20	07	03	56	19	53	04	02	19	39	04	07	20	23	03	5
3	A	☌ *Crom.* died 1658	21	06	03	33	20	51	03	39	20	37	03	44	21	22	03	2
4	B		22	04	03	10	21	50	03	15	21	36	03	21	22	20	03	0
5	C		23	03	02	47	22	49	02	52	22	34	02	58	23	19	02	4
6	D		24	01	02	23	23	47	02	29	23	33	02	35	24	17	02	1
7	E		25	00	02	00	24	46	02	06	24	32	02	11	25	16	01	5
8	F		25	59	01	37	25	45	01	42	25	30	01	48	26	15	01	3
9	G		26	58	01	13	26	43	01	19	26	29	01	25	27	14	01	0
10	A	Andromeda's Head.	27	57	00	50	27	42	00	56	27	28	00	01	28	13	00	4
11	B		28	55	00	26	28	41	00	32	28	27	00	38	29	11	00	2
12	C	End of Pegasus's Wing.	29	54	00	03	29	40	00	09	29	26	00	14	♎.	10	*Sou.*	3
13	D	*Sol* in *Libra*.	♎.	53	*Sou.*	21	♎.	39	*Sou.*	15	♎.	25	*Sou.*	09	01	09	00	2
14	E	Sun r. 6.2.	01	52	00	44	01	38	00	38	01	24	00	33	02	08	00	5
15	F		02	51	01	08	02	37	01	02	02	23	00	56	03	07	01	1
16	G		03	50	01	31	03	36	01	25	03	22	01	20	04	06	01	3
17	A		04	49	01	55	04	35	01	49	04	21	01	43	05	05	02	0
18	B		05	48	02	18	05	34	02	12	05	20	02	07	06	04	02	2
19	C		06	47	02	42	06	33	02	36	06	19	02	30	07	04	02	4
20	D		07	47	03	05	07	32	02	59	07	18	02	54	08	03	03	1
21	E	*Matth.* Ev.	08	46	03	28	08	31	03	23	08	17	03	17	09	02	03	3
22	F	Pole Star.	09	45	03	52	09	31	03	46	09	16	03	40	10	01	03	5
23	G		10	44	04	15	10	30	04	09	10	16	04	04	11	00	04	2
24	A		11	44	04	38	11	39	04	33	11	15	04	27	12	00	04	4
25	B	Sun r. 6.24	12	43	05	02	12	29	04	56	12	14	04	50	12	59	05	0
26	C	Southermost in Andromeda's Girdle	13	42	05	25	13	28	05	19	13	14	05	14	13	59	05	3
27	D		14	42	05	48	14	27	05	42	14	13	05	37	14	58	05	5
28	E		15	41	06	11	15	27	06	05	15	12	06	00	15	57	06	1
29	F	*Mic.* Arch.	16	41	06	34	16	26	06	28	16	12	06	23	16	57	06	4
30	G		17	40	06	57	17	26	06	51	17	11	06	46	17	56	07	0

Month days.	Week days.	Remarkable days & southing of stars at midnight.	First Year. 1685. 1689. ☉ pla. D. M.	☉ dec. D. M.	Second Year. 1686. 1690. ☉ pla. D. M.	☉ dec. D. M.	Third Year. 1687. 1691. ☉ pla. D. M.	☉ dec. D. M.	Leap-Year. 1688. 1692. ☉ pla. D. M.	☉ dec. D. M.
			♑.	South.	♑.	South.	♑.	South.	♑.	South.
01	A		18 40	07 19	18 25	07 14	18 11	07 08	18 56	07 26
02	B		19 39	07 42	19 25	07 36	19 10	07 31	19 54	07 48
03	C		20 39	08 04	20 25	07 59	20 10	07 54	20 55	08 11
04	D		21 39	08 27	21 24	08 22	21 10	08 16	21 55	08 33
05	E	Sun r. 6.44	22 38	08 49	22 24	08 44	22 09	08 38	22 55	08 55
06	F		23 38	09 11	23 24	09 06	23 09	09 01	23 54	09 17
07	G		24 38	09 33	24 23	09 28	24 09	09 23	24 54	09 39
08	A		25 38	09 55	25 23	09 50	25 09	09 45	25 54	10 01
09	B		26 37	10 17	26 23	10 12	26 08	10 07	26 54	10 23
10	C		27 37	10 39	27 23	10 34	27 08	10 28	27 54	10 45
11	D	*Andromedas*	28 37	11 00	28 23	10 55	28 08	10 50	28 54	11 06
12	E	southermost	29 37	11 22	29 23	11 16	29 08	11 11	29 53	11 27
13	F	Foot. *Sol* in *Scorp.*	♏. 37	11 43	♏. 23	11 38	♏. 08	11 32	♏. 53	11 48
14	G	Sun r. 7.1.	01 37	12 04	01 23	11 59	01 08	11 53	01 53	12 09
15	A		02 37	12 24	02 23	12 19	02 08	12 14	02 53	12 30
16	B		03 37	12 45	03 23	12 40	03 08	12 35	03 54	12 50
17	C		04 37	13 05	04 23	13 00	04 08	12 55	04 54	13 11
18	D	*Luke* Ev.	05 37	13 25	05 23	13 21	05 08	13 16	05 54	13 31
19	E		06 38	13 45	06 23	13 41	06 08	13 36	06 54	13 51
20	F		07 38	14 05	07 23	14 00	07 09	13 56	07 54	14 10
21	G		08 38	14 25	08 23	14 20	08 09	14 15	08 54	14 30
22	A		09 38	14 44	09 24	14 39	09 09	14 34	09 55	14 49
23	B		10 39	15 03	10 24	14 58	10 09	14 54	10 55	15 08
24	C		11 39	15 22	11 24	15 17	11 10	15 13	11 55	15 27
25	D		12 39	15 40	12 25	15 36	12 10	15 31	12 56	15 45
26	E	Whales Jaw	13 40	15 59	13 25	15 54	13 10	15 50	13 56	16 03
27	F		14 40	16 17	14 25	16 12	14 11	16 08	14 56	16 21
28	G	*Sim.* & *Jude*	15 40	16 34	15 26	16 30	15 11	16 25	15 57	16 39
29	A	*Perseus*	16 41	16 52	16 26	16 48	16 12	16 43	16 57	16 56
30	B	right Side.	17 41	17 09	17 27	17 05	17 12	17 01	17 58	17 13
31	C	Sun r. 7.32	18 42	17 26	18 27	17 22	18 13	17 18	18 58	17 30

Month days.	Week days.	Remarkable days & ſouthing of ſtars at midnight.	First Year. 1685. 1689. ⊙ pla. D. M.	⊙ dec. D. M.	Second Year. 1686. 1690. ⊙ pla. D. M.	⊙ dec. D. M.	Third Year. 1687. 1691. ⊙ pla. D. M.	⊙ dec. D. M.	Leap-Year, 1688. 1692. ⊙ pla. D. M.	⊙ dec. D. M.
			m.	South.	m.	South.	m.	South.	m.	South.
1	D	All Saints.	19 42	17 43	19 28	17 38	19 13	17 34	19 59	17 47
2	E		20 43	17 59	20 28	17 55	20 14	17 51	21 00	18 03
3	F		21 44	18 15	21 29	18 11	21 14	18 07	22 00	18 19
4	G		22 44	18 30	22 30	18 26	22 15	18 23	23 01	18 34
5	A	Pow. Plot.	23 45	18 45	23 30	18 42	23 15	18 38	24 01	18 50
6	B		24 46	19 00	24 31	18 57	24 16	18 53	25 02	19 04
7	C		25 46	19 15	25 32	19 12	25 17	19 08	26 03	19 19
8	D	Sun r. 7.44	26 47	19 29	26 32	19 26	26 18	19 22	27 04	19 33
9	E		27 48	19 43	27 33	19 40	27 18	19 37	28 04	19 47
10	F		28 49	19 57	28 34	19 54	28 19	19 50	29 05	20 00
11	G		29 49	20 10	29 35	20 07	29 20	20 04	♐. 06	20 14
12	A	*Sol* in *Sagit.*	♐. 50	20 22	♐. 35	20 20	♐. 20	20 17	01 07	20 26
13	B		01 51	20 35	01 36	20 32	01 21	20 29	02 08	20 39
14	C		02 52	20 47	02 37	20 44	02 22	20 41	03 08	20 51
15	D		03 53	20 59	03 38	20 56	03 23	20 53	04 09	21 02
16	E		04 54	21 01	04 39	21 08	04 24	21 05	05 10	21 13
17	F	Bulls Eye, or *Aldebaran.*	05 55	21 21	05 40	21 19	05 25	21 16	06 11	21 24
18	G		06 56	21 32	06 41	21 29	06 26	21 27	07 12	21 34
19	A		07 57	21 42	07 42	21 39	07 27	21 37	08 13	21 44
20	B	Sun riſe 8.	08 58	21 51	08 43	21 49	08 28	21 47	09 14	21 54
21	C	*Wapping* burnt 1682.	09 59	22 01	09 44	21 58	09 29	21 56	10 15	22 03
22	D		11 00	22 09	10 45	22 07	10 30	22 05	11 16	22 12
23	E		12 01	22 18	11 46	22 16	11 31	22 14	12 17	22 20
24	F		13 02	22 26	12 47	22 24	12 32	22 22	13 18	22 28
25	G		14 03	22 33	13 48	22 31	13 33	22 30	14 19	22 35
26	A	*Capella*, or Goat.	15 04	22 40	14 49	22 39	14 34	22 37	15 20	22 42
27	B	*Orion*'s Left	16 05	22 47	15 50	22 45	15 35	22 44	16 22	22 49
28	C	Foot.	17 06	22 53	16 51	22 52	16 36	22 50	17 23	22 55
29	D	End of Bulls Horn.	18 07	22 59	17 52	22 57	17 37	22 56	18 24	23 00
30	E	*Andr.* Ap.	19 08	23 04	18 53	23 03	18 39	23 01	19 25	23 05

Month days.	Week days.	Remarkable days, & southing of stars at Midnight.	First Year. 1685. ☉ pla. D. M.	☉ dec. D. M.	Second Year. 1689. ☉ pla. D. M.	☉ dec. D. M.	Third Year. 1686. ☉ pla. D. M.	☉ dec. D. M.	Fourth Year. 1690. ☉ pla. D. M.	☉ dec. D. M.	Leap-Year. 1687. ☉ pla. D. M.	☉ dec. D. M.	1691. ☉ pla. D. M.	☉ dec. D. M.
			♐.	South.	♐.	South.	♐.	South.	♐.	South.	♐.	South.	♐.	South.
01	F	First in *Orion*'s Belt.	20 09	23 08	19 55	23 07	19 40	23 05	20 26	23 09				
02	G		21 11	23 12	20 56	23 11	20 41	23 10	21 27	23 13				
03	A	Last in *Orion*'s Belt.	22 12	23 16	21 57	23 15	21 42	23 14	22 28	23 17				
04	B		23 13	23 19	22 58	23 19	22 43	23 18	23 30	23 20				
05	C	Sun r. 8.11	24 14	23 22	23 59	23 22	23 44	23 21	24 31	23 23				
06	D	*Orion*'s right Shoulder & *Auriga*'s right should.	25 15	23 25	25 00	23 24	24 46	23 24	25 32	23 25				
07	E		26 17	23 27	26 02	23 26	25 47	23 26	26 33	23 27				
08	F		27 18	23 28	27 03	23 28	26 48	23 28	27 34	23 29				
09	G		28 19	23 29	28 04	23 29	27 49	23 29	28 36	23 29				
10	A		29 20	23 30	29 05	23 30	28 50	23 30	29 37	23 30				
11	B	*Sol* in *Capr.*	♑. 21	23 30	♑. 07	23 30	29 51	23 30	♑. 38	23 30				
12	C	Sun r. 8.12	01 23	23 30	01 08	23 30	♑. 53	23 30	01 39	23 29				
13	D	Foot of the great Dog. Bright Foot of *Gemini.*	02 24	23 29	02 09	23 29	01 54	23 29	02 40	23 28				
14	E		03 25	23 28	03 10	23 28	02 55	23 28	03 42	23 27				
15	F		04 26	23 26	04 11	23 26	03 57	23 27	04 43	23 25				
16	G		05 28	23 23	05 13	23 24	04 58	23 25	05 44	23 23				
17	A	Sun r. 8.11	06 29	23 21	06 14	23 21	05 59	23 22	06 45	23 20				
18	B	Mouth of the great Dog, or *Syrius.*	07 30	23 17	07 15	23 18	07 00	23 19	07 47	23 16				
19	C		08 31	23 14	08 16	23 15	08 02	23 16	08 48	23 13				
20	D		09 33	23 10	09 18	23 11	09 03	23 12	09 49	23 08				
21	E	*Tho.* Apost.	10 34	23 05	10 19	23 06	10 04	23 07	10 50	23 04				
22	F		11 35	23 00	11 20	23 01	11 05	23 02	11 52	22 58				
23	G		12 36	22 54	12 21	22 56	12 07	22 57	12 53	22 53				
24	A		13 37	22 48	13 23	22 50	13 08	22 51	13 54	22 47				
25	B	Nat. *Christ.*	14 39	22 42	14 24	22 44	14 09	22 45	14 55	22 40				
26	C	St. *Stephen.*	15 40	22 35	15 25	22 37	15 10	22 39	15 57	22 33				
27	D	*John* Evan.	16 41	22 28	16 26	22 30	16 11	22 31	16 58	22 16				
28	E	*Innocents.*	17 42	22 20	17 27	22 22	17 13	22 24	17 59	22 18				
29	F	Castor. Little Dog's	18 44	22 12	18 29	22 14	18 14	22 16	19 00	22 09				
30	G	thigh. Pollux	19 45	22 03	19 30	22 05	19 15	22 07	20 01	22 01				
31	A	Sun r. 8.1	20 46	21 54	20 31	21 56	20 16	21 59	21 03	21 52				

A Table of the Variation of the Sun's Declination, to every 15 Degrees of Longitude from the Meridian of *London*.

Degrees of Longitude from the Meridian of London.

Diurn. Variat.	D. 15	D. 30	D. 45	D. 60	D. 75	D. 90	D. 105	D. 120	D. 135	D. 150	D. 165	D. 180
min.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	01	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	03	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	02	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	01	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	06	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

Explanation of the Kalendar.

IN every Page there is eleven Columns; the first shews the Days of the Month; the second the Days of the Week, expressed by the Letters A, B, C, *&c.* the third the Southing of several Stars at Midnight, at which time the said Stars are to be observed, thereby to find the Latitude; in the same Column is given the time of Sun Rising (and by subtracting the time of Rising from 12 Hours, the time of Setting) to about every quarter of an Hours difference; the eight following Columns shew the Sun's Place and Declination for the First, Second, Third, and Leap-Year, according to their respective Titles.

For the more ready knowing of Leap-Year, the following Table is inserted, where it is found by inspection, as also the First, Second, or Third Years after Leap-Year.

The Table.

First Year.	Second Year.	Third Year.	Leap-Year.
1685	1686	1687	1688
1689	1690	1691	1692
1693	1694	1695	1696
1697	1698	1699	1700
1701	1702	1703	1704
1705	1706	1707	1708
1709	1710	1711	1712
1713	1714	1715	1716
1717	1718	1719	1720
1721	1722	1723	1724

The Use of the Kalendar.

To find the Day of the Week or Month for any time past, or to come, by the Kalendar.

First, Find the Dominical Letter for the Year, then proceed as follows.

Example

Example 1.

Suppoſe it were required to find what Day of the Month was the Third Wedneſday in *March* 1685.

Having found the Dominical Letter, which is D, turn to the Month of *March*, and account D for Sunday, three days downward from which is G for Wedneſday, and the Third Wedneſday is the 18*th* day of *March*, as was required.

Example 2.

What Day of the Week will the Second of *September* be in the Year 1688?

This Year being Leap-Year, hath two Dominical Letters, A and G, the firſt ſerving from the firſt of *January* to the 25*th* of *February*; the latter from thence to the Years end.

Wherefore looking againſt the Second of *September*, there ſtands G, which repreſents Sunday, the Day of the Week required.

Note, That the *Gregorian* or *Foreign Account* begins ten Days before ours, ſo that our 1*ſt* of *January* is their 11*th*, our 11*th* their 21*ſt*, our 21*ſt* their 31*ſt*, our 24*th* of *February* their 6*th* of *March*, but in Leap-Year, our 24*th* of *February* is their 5*th* of *March*, becauſe then *February* hath 29 Days.

To find the Sun's Place and Declination by the Kalendar.

Example 1.

Suppoſe the Sun's Place and Declination to be required on the 10*th* of *January* 1687, being third after Leap-Year.

In the Month of *January*, in the firſt Column, look the Day of the Month, over againſt which, under the third Year, ſtands ♒ 42; that is, the Sun's place is in 42 min. of *Aquarius*. In the next Column under the ſaid Year ſtands 20 03 under the Title *South*, which ſhews the Declination to be 20 deg. 03 min. ſoutherly; and this ſerves either for the Year 1687 or 1691 on the ſaid 10*th* of *January*, being the third after Leap-Year.

Example 2.

Suppoſe the Sun's Place or Declination to be required on the 10*th* of *March* 1676, being Leap-Year.

In the Month of *March*, in the firſt Column, find the day of the Month; over againſt which, under Leap-Year, ſtands ♈ 47, which ſhews the Sun's place to be in 47 min. of *Aries*; and in the next Column, under Leap-Year, ſtands *Nor.* 18. which ſhews the Declination to be 18 min. Northerly, which was required.

Altho it is common to take the Declination as it is in the Kalendar, yet if the difference of Longitude be conſiderable from *London*, it is requiſite the Declination ſhould be corrected, becauſe in the Kalandar it is calculated to the Meridian of *London*, for which end the *Table of Variation of the Sun's Declination to every* 15 *Degrees of Longitude from the Meridian of London*, immediately following the Kalendar, is added; the Uſe and Explanation whereof follows.

The Explanation of the Table of Variation of the Sun's Declination to every 15 *Degrees of Longitude*, &c.

In the firſt Column is the Diurnal Variation, which is found by ſubtracting the Declination from the given day of the Month from the Declination for the day following; or contrarily this from that, that is, the leſſer from the greater, and the Difference is the Diurnal Variation. In the head of the other Columns are the degrees of Longitude from *London*, either Eaſterly or Weſterly; and in thoſe Columns under the reſpective Degrees of Longitude, are the Minutes of Declination anſwerable to the Diurnal Variation. As ſuppoſe the Diurnal Variation were 10 Minutes, and the Difference of Longitude 90 Degrees: againſt 10 in the firſt Column, and under 90 Degrees at the head of the Table, ſtands 2 Minutes, which anſwers thereto, and is to be uſed as follows.

The Use of the Table of the Variation of the Sun's Declination, &c.

The Rule.

First, If the Difference of Longitude be Westerly, and the Declination increasing, the Variation found in this Table must be added to the Declination found in the Kalendar; but if the Declination be decreasing, it must be subtracted therefrom.

Secondly, If the Difference of Longitude be Easterly, and the Declination increasing, the Variation aforesaid must be subtracted; but the Declination decreasing, it must be added.

Example 1.

April the 10*th*, 1678, being at Sea, the Difference of Longitude from the Meridian of *London*, being 90 degrees Westerly, I find the Declination in the Kalendar to be 11 deg. 44 min. North, and the 11*th* day, the Declination is 12 deg. 05 min. therefore subtracting the lesser Declination from the greater, the Remainder is 21 min. which is the daily increase. Then in the Table under 90 deg. and over against 21, stands 5 min. which (because the Difference of Longitude is Westerly, and the Declination increasing) must be added to 41 deg. 44 min. before found, which makes the true Declination 11 deg. 49 min. North.

If the Difference of Longitude in this case had been Easterly, the 5 min. found in the Table must have been subtracted.

It is easily discerned whether the Declination increase or decrease, by observing whether the Declination for the day following be greater or lesser; for if it be greater, then it increases; but if less, then it decreases.

Example 2.

January the 10*th*, 1678, being at Sea, the Difference of Longitude from *London*, being 120 deg. Westerly, I find the Declination in the Kalendar, to be 20 deg. 00 min. South, and the 11*th* day it is 19 deg. 46 min. therefore subtracting the lesser from the greater, the Difference is 14 min. which is the daily decrease; then in this Table under 120 deg. and against 14 stands 5 min. which (because the Difference

rence of Longitude is Westerly, and the Declination decreasing) must be subtracted, which makes the true Declination 19 deg. 55 min. South. If the Difference of Longitude had been Easterly, the 5 minutes must have been added.

The Use of the Sun's Declination, to find the Latitude.

The Declination of the Sun is mostly used at Sea, with the Complement of the Sun's Meridian Altitude, taken by the Quadrant or Fore-Staff, to find the Latitude of the Place: for which take the following Directions.

1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Altitude, is the Latitude Northerly.

Example.

Suppose being at Sea, the 10*th* of *April* 1674, the Declin. is found by the Table to be 11 deg. 44 min. North, the Sun comes to the Meridian in the South: the Complement of the Altitude got by Observation is 23 deg. 10 min. What is the Latitude?

	°	′
Complement of the Altitude is———	23	10
Declination North added ———————	11	44
The Latitude North,———————————	34	54

2. If the Sun comes to the Meridian in the North, and hath North Declination, then subtract the Complement of the Altitude from the Declination, the Remainder is the Latitude North. But if the Complement of the Altitude exceed the Declination, subtract the Declination therefrom, and the Remainder is the Latitude Southerly.

Example 1.

Suppose being at Sea, *May* the 10*th* 1674; the Declination being 20 deg. 8 min. North, the Sun comes to the Meridian in the North, the Complement of the Altitude by Observation is 17 deg. 23 min. What is the Latitude?

	°	′	
Declination North is	20	08	
Compl. Alt. ſubtracted	17	23	
The Latitude is	02	45	North.

Example 2.

Suppoſe being at Sea, *June* the 10*th* 1675; the Declination by the Table is 23 deg. 30 min. North, the Complement of the Altitude by Obſervation is 33 deg. 10 min. the Sun comes to the Meridian in the North: What is the Latitude?

	°	′	
Compl. Alt. is	33	10	
Declinat. North ſubtracted	23	30	
Latitude is	09	40	South.

3. If the Sun comes to the Meridian in the North, and hath South-Declination, the Declination added to the Complement of the Altitude, is the Latitude South.

Example.

Suppoſe being at Sea, *January* the 10*th* 1674; the Sun comes to the Meridian in the North, the Complement of the Altitude is 22 deg. 10 min. the Declination 20 deg. South: What is the Latitude?

	°	′
Complement of the Altitude is	22	10
Declination South added	20	00
The Latitude South,	42	10

4. If the Sun comes to the Meridian in the South, and have South-Declination ſubtract the Complement of the Altitude from the Declination, the Remainder is the Latitude South. But if the Comple-

ment

ment of the Altitude exceed the Declination, ſubtract the Declination therefrom, the Remainder is the Latitude North.

Example 1.

Suppoſe being at Sea, *January* the 1*ſt* 1674, the Sun coming to the Meridian in the South, the Complement of the Altitude is 10 deg. 36 min. the Declination 21 deg. 44 min. South: What is the Latitude?

	°	′
Declination South	21	44
Compl. Alt. ſubtracted	10	36
Latitude South	11	08

Example 2.

Suppoſe being at Sea *February* the 10*th* 1674, the Sun coming to the Meridian in the South, the Complement of the Altitude is 25 deg. 20 min. the Declination 10 deg. 41 min. South? Wat is the Latitude?

	°	′
Compl. Alt. is	25	20
Declination South ſubtracted	10	41
Latitude North	14	39

5. If the Sun be in the Zenith, (that is, right over head) if it have either North or South Declination, the Declination is the Latitude Northerly or Southerly.

6. If the Sun have no Declination, the Complement of the Altitude is the Latitude, which is Northerly or Southerly, according as the Sun is to the North or South.

Days.	January ☉ Right Aſcen. H.	M	Febr. ☉ Right Aſcen. H.	M.	March. ☉ Right Aſcen. H.	M.	April. ☉ Right Aſcen. H.	M.	May. ☉ Right Aſcen. H.	M.	June. ☉ Right Aſcen. H.	M.
1	19	35	21	42	23	28	01	21	03	14	05	19
2	19	39	21	46	23	32	01	25	03	18	05	23
3	19	43	21	50	23	36	01	29	03	22	05	27
4	19	47	21	54	23	39	01	33	03	26	05	31
5	19	51	21	58	23	43	01	36	03	30	05	36
6	19	56	22	02	23	46	01	40	03	34	05	40
7	20	00	22	06	23	50	01	44	03	38	05	44
8	20	04	22	10	23	53	01	47	03	42	05	48
9	20	09	22	14	23	57	01	51	03	46	05	52
10	20	13	22	17	00	01	01	54	03	50	05	56
11	20	17	22	21	00	05	01	58	03	54	06	00
12	20	22	22	25	00	08	02	02	03	58	06	04
13	20	26	22	29	00	12	02	06	04	02	06	08
14	20	30	22	33	00	15	02	10	04	06	06	12
15	20	34	22	36	00	19	02	13	04	10	06	17
16	20	38	22	40	00	23	02	17	04	14	06	21
17	20	42	22	44	00	26	02	21	04	18	06	25
18	20	46	22	48	00	30	02	25	04	22	06	29
19	20	50	22	52	00	33	02	29	04	26	06	33
20	20	54	22	55	00	37	02	32	04	30	06	38
21	20	58	22	59	00	41	02	36	04	34	06	42
22	21	03	23	03	00	44	02	40	04	38	06	46
23	21	07	23	06	00	48	02	44	04	42	06	50
24	21	11	23	10	00	52	02	48	04	46	06	54
25	21	15	23	13	00	55	02	51	04	50	06	58
26	21	19	23	17	00	59	02	55	04	54	07	02
27	21	23	23	21	01	03	02	59	04	58	07	06
28	21	27	23	25	01	06	03	03	05	02	07	10
29	21	31			01	10	03	07	05	06	07	14
30	21	35			01	14	03	10	05	11	07	19
31	21	38			01	17			05	15		

Days.	July. ☉ Right Ascen. H.	M.	August. ☉ Right Ascen. H.	M.	Septem. ☉ Right Ascen. H.	M.	Octob. ☉ Right Ascen. H.	M.	Novem. ☉ Right Ascen. H.	M.	Decem. ☉ Right Ascen. H.	M.
1	07	23	09	25	11	19	13	08	15	07	17	15
2	07	27	09	29	11	23	13	12	15	11	17	20
3	07	31	09	33	11	26	13	15	15	15	17	25
4	07	35	09	37	11	30	13	19	15	19	17	29
5	07	39	09	40	11	33	13	22	15	23	17	34
6	07	43	09	44	11	37	13	26	15	27	17	38
7	07	47	09	48	11	41	13	30	15	31	17	42
8	07	51	09	51	11	44	13	34	15	36	17	47
9	07	55	09	55	11	48	13	38	15	40	17	51
10	07	59	09	58	11	51	13	41	15	45	17	56
11	08	03	10	02	11	55	13	45	15	49	18	00
12	08	07	10	06	11	59	13	49	15	53	18	05
13	08	11	10	10	12	02	13	53	15	58	18	09
14	08	15	10	14	12	06	13	57	16	02	18	14
15	08	19	10	17	12	09	14	00	16	07	18	19
16	08	23	10	21	12	13	14	04	16	11	18	24
17	08	27	10	25	12	17	14	08	16	15	18	28
18	08	31	10	28	12	20	14	12	16	19	18	33
19	08	35	10	32	12	24	14	16	16	23	18	37
20	08	39	10	35	12	27	14	20	16	28	18	41
21	08	43	10	39	12	31	14	24	16	32	18	45
22	08	47	10	43	12	35	14	28	16	36	18	49
23	08	51	10	46	12	38	14	32	16	40	18	54
24	08	55	10	50	12	42	14	36	16	44	18	58
25	08	58	10	53	12	45	14	39	16	49	19	03
26	09	02	10	57	12	49	14	43	16	53	19	07
27	09	06	11	01	12	53	14	47	16	57	19	11
28	09	10	11	04	12	57	14	51	17	02	19	16
29	09	14	11	08	13	01	14	55	17	06	19	20
30	09	17	11	11	13	04	14	59	17	11	19	25
31	09	21	11	15			15	03			19	30

A Table of Right Aſcenſion and Declination of ſome of the moſt notable Fixed Stars.

Stars Names.	Magnit.	Right Aſcenſ. H.	Right Aſcenſ. M.	Declination. D.	Declination. M.	N. or S.
Pole Star	02	00	32	87	33	N
The upper of the two foremoſt of the Square in the Little Bear	02	14	51	75	36	N
The upper of the two foremoſt of the Square in the Great Bear	02	10	43	63	32	N
The lower of the two foremoſt of the Square in the Great Bear	02	10	41	58	08	N
The lower of the two latter of the Square of the Great Bear	02	11	36	55	33	N
The upper of the two latter in the Square of the Great Bear	02	11	59	58	51	N
Laſt but two in the Great Bear's Tail	02	12	40	57	47	N
Laſt but one in the ſame	02	13	10	56	41	N
Laſt in the ſame	02	13	34	51	00	N
The Dragon's Tail	02	13	59	65	56	N
Arcturus	01	14	01	20	58	N
Brighteſt in the Crown	02	15	21	27	51	N
Brighteſt in the Harp	01	18	26	38	30	N
Swan's Tail	02	20	30	44	05	N
Perſeus Right-Side	02	02	57	48	36	N
Goat or Capella	01	04	52	45	37	N
Auriga's Right Shoulder	02	05	44	44	56	N
Brighteſt in the Serpent's Neck	02	15	28	07	30	N
Brighteſt between the Eagle's Shoulders	02	19	35	08	03	N
Firſt in Pegaſus Wing, or Marchab	02	22	48	13	28	N
Beginning of Pegaſus Leg	02	22	48	26	18	N
End of Pegaſus Wing	02	23	57	13	22	N
Andromeda's Head	02	23	52	27	18	N
Southermoſt in Andromeda's Girdle	02	00	51	33	55	N
Andromeda's Southermoſt Foot	02	01	44	40	44	N

A Table of Right Aſcenſion and Declination of ſome of the moſt notable Fixed Stars.

Stars Names.	Magnit.	Right Aſcenſ. H.	M.	Decli-nation. D.	M.	N. or S.
The Bull's Eye, or Aldebrand	01	04	17	15	48	N
End of the Bull's Horn	02	05	06	28	21	N
Caſtor	02	07	14	32	33	N
Pollux	02	07	25	28	46	N
Bright Foot of Gemini	02	06	19	16	38	N
Brighteſt in the Lion's Neck	02	10	02	21	29	N
Lion's Heart	01	09	51	13	33	N
Lion's Tail	01	11	32	16	25	N
Virgin's Spike	01	13	08	09	31	S
Southermoſt Scale of Libra	02	14	33	14	37	S
Northermoſt Scale of Libra	02	14	59	08	07	S
Scorpion's Forehead	02	15	46	18	51	S
Scorpion's Heart	01	16	10	25	37	S
Fomahant	01	22	39	31	17	S
Whale's Jaw	02	02	45	02	48	N
Orion's Right Shoulder	02	05	38	07	18	N
Orion's Left Shoulder	02	05	08	06	01	N
Firſt in Orion's Belt	02	05	15	00	35	S
Middle of Orion's Belt	02	05	20	01	26	S
Laſt in Orion's Belt	02	05	24	02	09	S
Orion's left Foot, or Regel	01	04	59	08	37	S
Mouth of the Great Dog, or Syrius	01	06	31	16	14	S
Right Forefoot of the Great Dog	02	06	09	17	49	S
Little Dog's Thigh	02	07	22	06	03	N
Hydra's Heart.	01	09	12	07	15	S

The Explanation and Uſe of the TABLE *of the Sun's Right Aſcenſion: and of the* Table *of the Stars Right Aſcenſion and Declination.*

IN the Table of the Sun's Right-Aſcenſion, the firſt Page contains the firſt ſix Months of the Year, the next Page the other ſix Months. At the head of the Table are the Months; in the firſt Column towards the left hand are the Days of the Month, and in the oppoſite Columns is the Right-Aſcenſion in Hours and Minutes.

In the Table of the Stars Right-Aſcenſion and Declination, there are five Columns; In the firſt towards the left hand, are the names of the Stars; in the ſecond, the Stars magnitude; in the third, their Right-Aſcenſion in hours and minutes; in the fourth, their Declination in degrees and minutes; the laſt, ſhews whether the Declination be North or South.

The Uſe of the Tables.

Firſt, To find the time of the Stars coming upon the Meridian.

The Rule.

Look the Right-Aſcenſion of the Sun and Star; ſubtract the Right-Aſcenſion of the Sun from the Right-Aſcenſion of the Star; but if the Star's Right-Aſcenſion be leſs than the Sun's, add thereto 24 hours, and then ſubtract; the Remainder after Subtraction, is the time of the Star's coming upon the Meridian from Noon: but if the Remainder exceed 12 hours, ſubtract 12 hours therefrom, and then the Remainder is the time from Midnight.

Example 1.

Suppoſe the time that *Fomahant* comes upon the Meridian on the 10*th* of *October* 1685, were required.

I find in the Table the Star's Right-Aſcenſion to be 22 hours 39 min. and the Sun's to be 13 hours 41 min. which ſubtracted from the Star's Right-Aſcenſion, leaves 8 hours 58 min. the time of the Star's coming upon the Meridian After-noon.

Example 2.

Suppoſe the time that the *Whales Jaw* comes upon the Meridian on the 15*th* of *October* 1685. was required.

I find the Star's Right-Aſcenſion to be 2 hours 45 min. the Sun's 14 hours: Now becauſe the Sun's Right-Aſcenſion is more than the Star's, add

add to the Stars Right-Aſcenſion 24 hours, which makes 26 hours 45 min. from which ſubtracting the Sun's Right-Aſcenſion, there remains 12 hours 45 min. from which ſubtracting 12 hours, there remains 45 min. which is the time of the Star's ſouthing after Midnight, which was required.

Secondly, The time being given, to find what Star will come to the Meridian about the ſaid time.

The Rule.

To the Star's Right-Aſcenſion, add the time from Noon, at which the Star's coming to the Meridian is deſired: the ſum is the Right-Aſcenſion of the Star that will come to the Meridian at that time; with which enter the Table of the Star's Right-Aſcenſion and Declination, where look what Star's Right-Aſcenſion agrees with the Right-Aſcenſion before found, or neareſt thereto, and that is the Star ſought for.

Example.

Suppoſe *March* the 27*th*, I deſire to know what Star will come upon the Meridian at 4 hours after Midnight.

The Sun's Right-Aſcenſion is 1 hour 3 minutes; the time from Noon is 16 hours, which added to the Sun's Right-Aſcenſion, makes 17 hours 3 minutes. The neareſt in the Table, are, the *Scorpion's Heart*, whoſe Right-Aſcenſion is 16 hours 10 min. and comes to the Meridian 53 min. before 4; and the *Brighteſt in the Harp*, whoſe Right-Aſcenſion is 18 hours 26 min. and therefore comes to the Meridian 1 hour 23 min. after 4, or, at 5 hours 23 min.

Directions for Obſervation of the Stars, to find the Latitude of the Place.

Having before ſhewn how to find the time of a Star's coming to the Meridian, I ſhall now ſhew how thoſe Stars are to be obſerved.

Note, Firſt, in North-Latitude, Thoſe Stars whoſe North-Declination exceeds the Complement of the Latitude, may be obſerved under the Pole.

Secondly, *Note*, In South Latitude, thoſe Stars whoſe Declination South is more than the Complement of the Latitude, may be obſerved under the Pole.

To make this plain, I ſhall give ſome Examples.

Rule 1.

If the Star comes to the Meridian in the South, and have North Declination, the Complement of the Altitude (got by Obſervation) added to the Declination of the Star (found in the Table of the Stars Right Aſcenſion and Declination) gives the Latitude North.

Example.

On the 10*th* of *June* 1685, being at Sea, I find by the forgoing Directions, that the *bright Star between the Eagles ſhoulders*, comes to the Meridian in the South, at 1 hour 39 min. after Midnight, the Meridional Altitude whereof by Obſervation is 63 deg. which ſubtracted from 90 deg. there remains 27 deg. the Complement of the Altitude; to which adding 8 deg. 3 min. the Declination of the Star North, gives 35 deg. 3 min. the Latitude of the place North, which was required.

Rule 2.

If a Star comes to the Meridian in the South, and have South Declination, ſubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North; But if the Declination exceed the Compl. of the Altitude, ſubtract the Compl. of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1.

Suppoſe on the 10*th* of *July* 1685, being at Sea, the Star *Fomahant* coming to the Meridian in the South, at 2 hours 40 min. after Midnight, the Meridional Alt. is 35 deg. 50 min. the Compl. whereof is 54 deg. 10 min. the Stars Declination is 31 deg. 17 min. South; which ſubtracted from the Compl. of Altitude, leaves 22 deg. 53 min. the Latitude North.

Example 2.

Suppoſe on the 20*th* of *June* 1685, being at Sea, the *Scorpions Heart* comes to the Meridian in the South, at 9 hours, 32 min. at Night, the Complement of the Altitude, is 5 deg. 27 min. the Declination 25 deg. 37 min. South, from which ſubtracting the Compl. of the Altitude, there remains 20 deg. 10 min. which is the Latitude South.

Rule 3.

If a Star comes to the Meridian in the North, and have North Declination, ſubtract the Declination from the Compl. of the Altitude, the Remainder is the Lat. South. But if the Declination exceed the Compl. of the Altitude, ſubtract the Compl. of the Altitude therefrom, the Remainder is the Latitude North.

Example.

Example 1.

On the 11*th* of *June* 1685, the *Brighteſt in the Harp* comes to the Meridian in the North at 26 min. after Midnight, the Compl. of the Altitude is 79 deg. from which ſubtracting the Declination, which is 38 deg. 30 min. North, there remains 40 deg. 30 min. which is the Latitude South.

Example 2.

On the 8*th* of *September* 1685, *Andromeda's Head* comes to the Meridian in the North at 8 min. after Midnight; the Complement of the Altitude is 7 deg. 10 min. which ſubtracted from the Declination 27 deg. 18 min. gives 20 deg. 8 min. which is the Lat. North.

Rule 4.

If a Star come to the Meridian in the North, and have South Declination, the Compl. of the Altitude added to the Declination, gives the Lat. South.

Example.

On the 12*th* of *December*, *Syrius* (or the *Great Dogs Mouth*) comes to the Meridian in the North at 26 min. after Midnight, the Compl. of the Alt. is 30 deg. to which adding 16 deg. 14 min. the Declination South, gives 46 deg. 14 min. the Lat. South.

Rule 5.

If a Star come to the Meridian under the Pole, then add the Complement of the Declination to the Meridian Altitude, and the ſum is the Latitude either North or South, according to the Stars Declination.

Example.

On the 10*th* of *March* 1685, the Pole-Star comes to the Meridian under the Pole at 31 min. after midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 2 deg. 27 min. which added together, gives 46 deg. 57 min. which is the Latitude North.

Rule 6.

If the Star be in the *Zenith*, the Declination is the Latitude either North or South, according to the Declination of the Star.

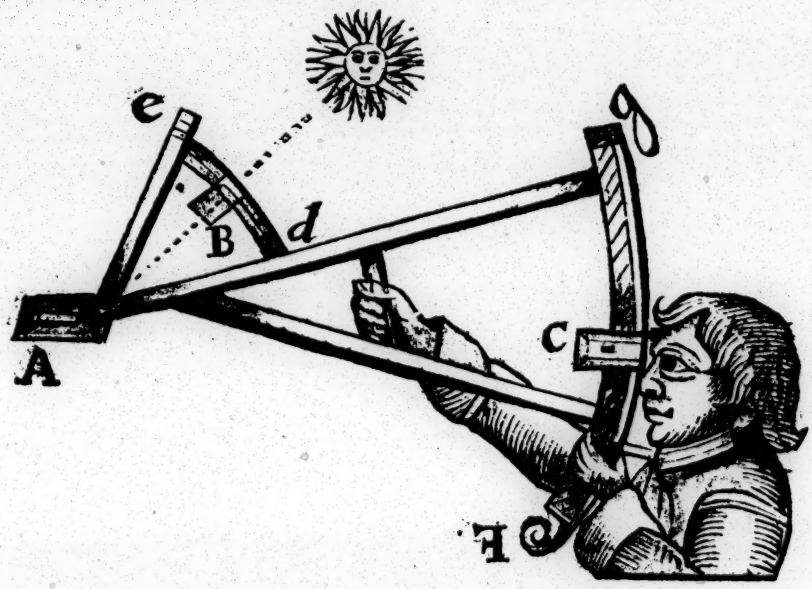
Rule 7.

If the Star have no Declination, the Compl. of the Meridian Alt. is the Lat. of the place either North or South, according as the Star is either to the Northward or Southward.

The

The next thing, because of its pertinency in this place, is the Use of the *Quadrant*, *Fore-Staff*, and *Nocturnal*.

The Figure of the Sea-Quadrant.



The Description and Use of the Quadrant.

THis Instrument consists of three Vanes and two Arches; the Horizon-Vane, which in observing, respects the Horizon, as at A. The Shadow-Vane, so called, because of its giving the Shadow upon the Horizon-Vane in time of Observation, as at B. Lastly, the Sight-Vane, which in time of Observation is placed at the Eye, through which the Shadow and Horizon are seen, as at C. The lesser of the Arches, marked with *d e*, is called the Sixty-Arch, because it contains sixty Degrees. In time of Observation the Shadow-Vane is placed upon this Arch always to an even degree, it is numbred from the upper end and downward with 5, 10, 15, 20, *&c.* The bigger Arch marked with *g F*, is called the Thirty-Arch, because it contains 30 degrees; it is divided into degrees and minutes.

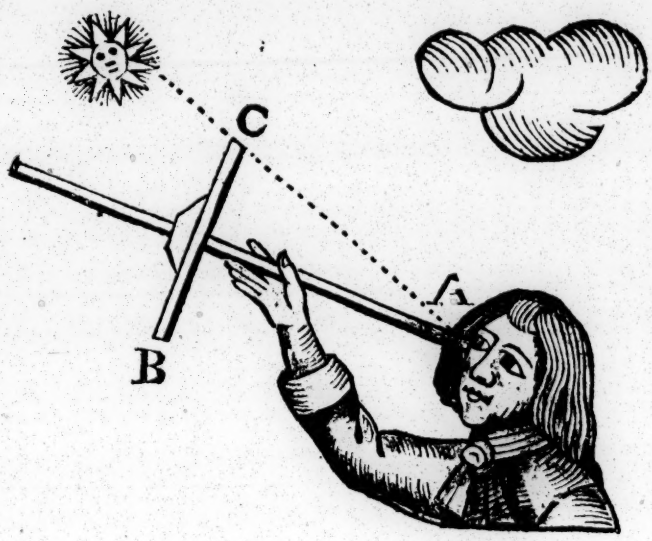
The

The Uſe of the Quadrant.

The Uſe of this Inſtrument, is to take the Sun's Meridian-Altitude, which is done in the manner following.

Put the Horizon-Vane upon the end of the Quadrant at A, the Shadow-Vane upon the Sixty (or leſſer) Arch, to a number of degrees leſs than the Complement of the Altitude by 15 or 20 degrees, and the Sight-Vane upon the 30 Arch. The Vanes being thus fixed upon the Quadrant, the back being turned towards the Sun, and the Sight-Vane placed to the Eye, look through the ſaid Sight-Vane, and cauſe the ſhadow of the upper edg of the Shadow-Vane, to fall upon the upper part of the ſlit in the Horizon-Vane, where uſually (for perſpicuity-ſake) there is drawn a black Line; and if at the ſame time the Horizon appear through the ſaid ſlit in the Horizon-Vane, that is the Sun's preſent Altitude; but if the Sea appear inſtead of the Horizon, then ſlide the Sight-Vane lower towards F; but if the Sky appear inſtead of the Horizon, then ſlide the Sight-Vane a little higher, until the Horizon appear through the Horizon-Vane. But to obtain the Meridian-Altitude (which is the greateſt Altitude the Sun will have that day, and is the thing uſed to find the Latitude) continue obſerving, and as the Sun riſes, the Sea will appear through the Horizon-Vane; then muſt the Sight-Vane be removed lower, and thus continue obſerving as often as may be convenient, till the Sun is at the higheſt, which is the Meridian-Altitude. When the Sun begins to fall, the Sky will appear inſtead of the Horizon, and then its time to give over obſerving for that Day. Having thus done, add the Degrees upon the Sixty-Arch, to the Degrees and Minutes upon the Thirty-Arch, and the Sum is the Complement of the Meridian-Altitude; the uſe of which, for finding the Latitude, is ſufficiently ſhewn in the preceding Rules.

The Figure of the Fore-ſtaff.



The Deſcription and Uſe of the Fore-ſtaff.

THis Inſtrument conſiſts of a Staff and four Croſſes, the firſt and ſhorteſt is called the Ten-Croſs, and it belongs to that ſide of the Staff, which is numbred from about 3 degrees, to 10 degrees. Sometime the Thirty-Croſs is ſo made, as that the breadth thereof ſerves inſtead of this Ten-Croſs.

The ſecond Croſs is called the Thirty-Croſs, and belongs to that ſide of the Staff which is numbred from about 10 degrees to 30.

The third Croſs is called the Sixty-Croſs, and belongs to that ſide of the Staff which is numbred from about 20 to 60 degrees.

The fourth and laſt Croſs is called the Ninety-Croſs, and belongs to that ſide of the Staff which is numbred from about 30 to 90 degrees.

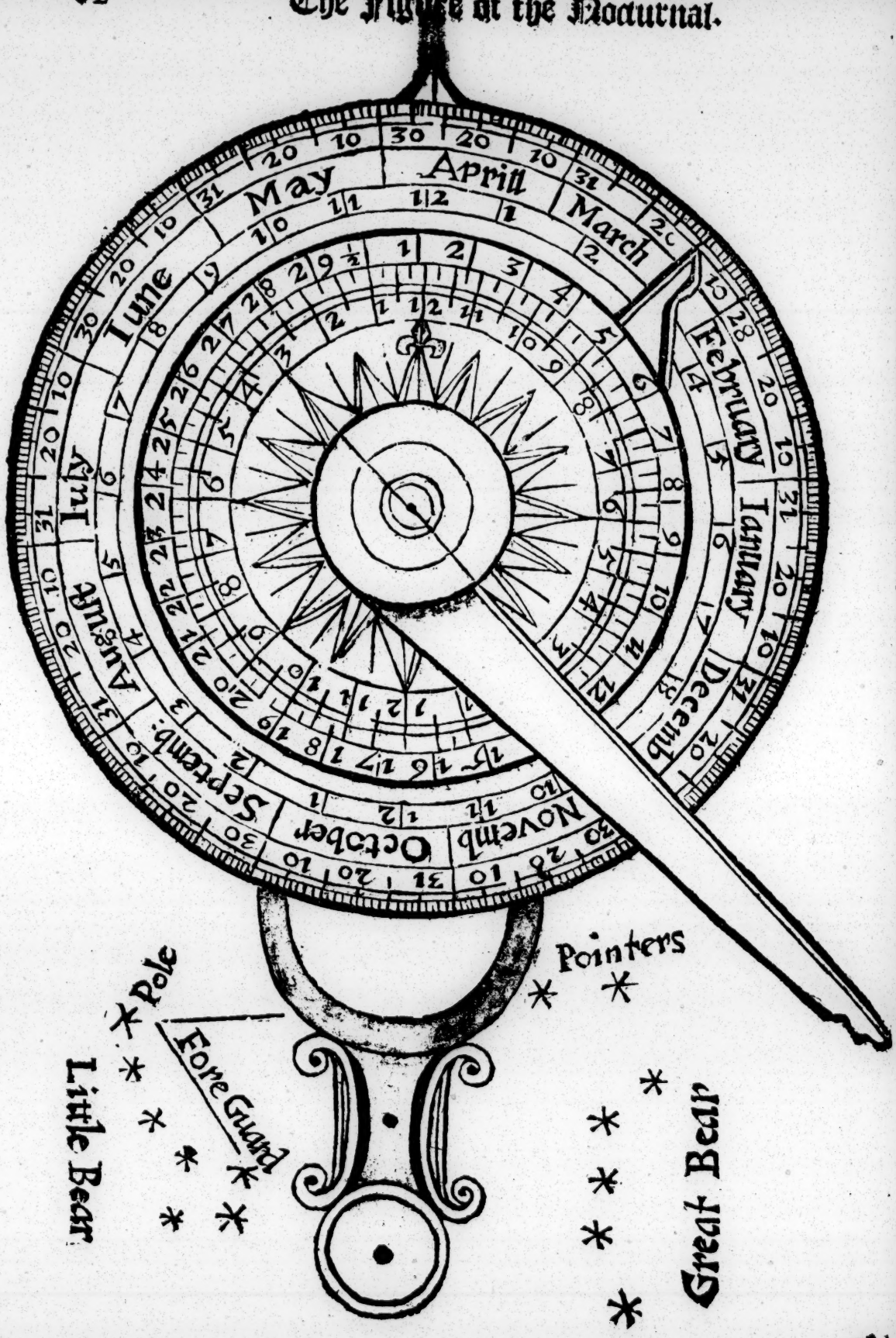
Sometimes this Staff is likewiſe numbred with the Complement to 90 degrees (*viz.*) at 10 ſtands 80, at 20 ſtands 70, at 30 ſtands 60, and ſo of the reſt.

The Uſe of the Fore-ſtaff.

The Uſe of this Inſtrument, is to take the Meridian Altitude of the Sun or Stars, which is done as follows.

Firſt; Conſider what the Sun's greateſt Altitude will be that day, and accordingly uſe the Croſs moſt ſuitable, (*viz.*) If the Meridian Altitude be judged to be under 10 degrees, uſe the Ten Croſs; if between 10 and 30, the Thirty Croſs; if between 30 and 60, the Sixty Croſs; if between 60 and 90, the Ninety Croſs.

Having put on the Croſs, place the flat end of the Staff as A, to the outſide of the Eye, as near as may be, without hindring the ſight; thus the Face being towards the Sun or Star, hold the Croſs upright; then look at the upper end of the Croſs at C, for the Sun or Star, and at the lower end at B for the Horizon, and if the Sea appear inſtead of the Horizon, remove the Croſs a little further from the Eye; but if the Sky appear inſtead of the Horizon, remove the Croſs a little nearer the Eye, until the Sun or Star appear at the upper end, and the Horizon at the lower end; which when they do, then upon the ſide of the Staff belonging to the Croſs uſed in Obſervation, will be found the Degrees and Minutes of the Altitude of the Sun or Star. But the greateſt Altitude being that which is required, Obſervation muſt be continued as frequently as Judgment ſhall direct, until the Sun or Star be at the higheſt; and as the Sun or Star riſes, the Sky will appear inſtead of the Horizon; but when the Sun or Star is paſt the Meridian, and begins to fall, the Sea will appear inſtead of the Horizon, and then is the Obſervation finiſhed; and upon the ſight of the Staff, proper to the Croſs uſed, are found the Degrees and Minutes of the Sun's Meridian Altitude; which ſubtracted from 90 Degrees, gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbred with the Complement, as is ſhewed before) with which to proceed in finding the Latitude of the Place, obſerve the Rules and Directions foregoing.


May
Aprill
March
Iune
February
Iuly
Ianuary
Aug.
December
Septemb.
November
October
Pole
Fore Guard
Little Bear
Pointers
Great Bear

The

The Deſcription and Uſe of the Nocturnal.

IT conſiſts of three parts. The firſt and unmoveable part, on which is the handle, by which to hold it in time of Obſervation; upon the fore-ſide of which, in the outermoſt Circle, are the days of the Month, and upon the innermoſt are ſet off the 24 Hours, upon the back-ſide are the 32 Points of the Compaſs.

There are two ſorts of Nocturnals, the one made for the Great Bear, the other for the Little Bear: Thoſe that are made for the Great Bear, have *February* at the top, but thoſe that are made for the Little Bear have *April*.

The ſecond, or middle part, contains two Circles and a ſmall Index; the outermoſt Circle is divided into the 29 days and $\frac{1}{2}$ of the Moon's Age, the innermoſt into 24 Hours: The Index is to be ſet to the Day of the Month at pleaſure.

The third, and uppermoſt part, is a long Index; the edge of which (that reſpects the Center) muſt be turned to the Guards in time of Obſervation.

The Uſe of the Nocturnal.

To find the hour of the Night, and upon what Point of the Compaſs the Guards are.

To do this, Firſt, ſet the Index of the middle part to the day of the Month; then hold the Inſtrument upright, which may be diſcerned by the Tip on the Top of the Nocturnal; then look through the Hole in the Middle of the Nocturnal for the North Star: which having found, turn the edge of the long Index to the Guards (for which the Nocturnal was made) either of the Little or Great Bear, then ſhall the edge of the Index (upon the innermoſt Circle of the middle part) give the Hour of the Night; and at the ſame time on the back-ſide of the Nocturnal, is the Point of the Compaſs on which the Guards are.

But if the Practitioner intends to be more exact and certain in the time of the Night, let him take the Altitude of ſome known Star, and proceed according to the Directions given in the *Tenth Aſtronomical Problem* following.

To find the Moon's Southing, and the time of Full Sea, by the Nocturnal.

To do this, It is but looking upon the middle piece of the Nocturnal, and in the outermoſt Circle find the Moon's Age, and oppoſite to it, in the innermoſt Circle of the ſame piece, ſtands the Southing.

Example.

Suppoſe the Moon 25 days old, and the time of her Southing required.

Look for 25, the Moon's Age, in the outermoſt Circle oppoſite to which, in the innermoſt Cirle, ſtands 8, which is the Moon's Southing at 25 days old required.

Note; That always between the Change and Full, the Moon comes to South in the Evening, but after the Full in the Morning.

Thus having found the Moon's Southing, add thereto the time of Flowing upon the Full and Change-Days at any place, and that gives the time of Full-Sea when required. But this hath been ſufficiently ſhewed in another place, therefore needs no Example.

The Uſe of the following Table of the Declination of the North-Star.

THE Uſe of the Table is this; Having taken the Altitude of the Pole-Star, then obſerve with the Nocturnal, upon what Point of the Compaſs the Guards are; oppoſite to which in this Table ſtands the Declination (ſo called); which if the Star be below the Pole, is to be added to the Altitude: but if the Star be above the Pole, to be ſubtracted thereof from to find the Latitude of the place.

But the more exact way to find the Latitude, is by thoſe other directions for the Stars before given.

Here

Here followeth a Table for the Declination of the North Star, upon every point of the Compass the Guards are upon, fitted for both sorts of Nocturnals.

If the former of the Guards be descending from the South, or upper part of the Merid.	If the former of the Guards be ascending from the North, or lower part of the Meridian.	Points of the Compass.	For the guard of the Little Bear.		For the guards of the Great Bear, or aftermost Wheels in *Charles's Wain*, called the two Pointers.		If the two Pointers be descending from the South, or upper part of the Meridian.	If the after-Wheels, or two Pointers be ascend. from the North, or lower part of the Merid.
			D.	M.	D.	M.		
		North.	2	09	2	20		
		N. by E.	1	52	2	30		
		N. N. E.	1	29	2	35		
		N. E. by N.	1	02	2	33		
		North East.	0	35	2	26		
		N. E. by E.	0	06	2	13		
		E. North E.	0	22	1	55		
		E. by N.	0	52	1	33		
		East.	1	18	1	07		
		E. by S.	1	41	0	38		
		E. S. E.	2	01	0	08		
		S. E. by E.	2	16	0	22		
		South East.	2	25	0	52		
		S. E. by S.	2	30	1	20		
		S. S. E.	2	29	1	44		
		S. by E.	2	22	2	04		
		South.	2	11	2	20		
		S. by W.	1	55	2	30		
		S. S. W.	1	34	2	29		
		S. W. by S.	1	10	2	28		
		South West.	0	43	2	26		
		S. W. by W.	0	14	2	13		
		W. S. W.	0	15	1	55		
		W. by S.	0	44	1	33		
		West.	1	11	1	07		
		W. by N.	1	36	0	38		
		W. N. W.	1	58	0	08		
		N. W. by W.	2	14	0	22		
		North West.	2	25	0	52		
		N. W. by N.	2	30	1	20		
		N. N. W.	2	29	1	44		
		N. by W.	2	22	2	04		

The North Star is above the Pole.

The North Star is under the Pole.

The North Star is above the Pole.

The North Star is under the Pole.

Above the Pole.

A Table of the Latitude and Longitude of the Principal Ports, Harbours, Headlands, and Islands in the World: Beginning from the Meridian of *Pico Teneriff.* Newly corrected according to the best Observations.

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Coast of *Greenland* and *Nova Zembla.*	*Hacluits Head-land*	79	35	N	32	50
	Fair Foreland	79	30	N	30	45
	Point Look-out	77	30	N	38	20
	Hope Island	76	58	N	46	45
	Cherry Island	75	19	N	45	30
	Ice Point	77	10	N	86	30
	Cape Nassaw	76	30	N	85	00
	Admiralties Island	75	10	N	83	20
	Fretum Burrough	66	30	N	83	30
Coast of *Lapland,* and *Norway.*	*Cape Candenose*	68	40	N	63	09
	Burgen	61	00	N	26	10
	Archangel	65	30	N	60	20
	Wards-hays	70	50	N	48	10
	Kildivia Isle	69	50	N	51	00
	North Cape	71	38	N	42	30
	Naze of Norway	58	11	N	26	30
Coast in the *Sound.*	*Gottenburgh*	58	10	N	31	20
	Danzick	54	23	N	40	00
	Stockholm	59	20	N	39	05
	Gotland Isle	58	20	N	39	15
	Copen-Haven	55	43	N	33	48
	Elsenore	56	40	N	33	50
	The Scaw	57	37	N	20	30

Hamburg

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Coast of *Holland* and *Flanders.*	*Hamburg*	53	50	N	29	20
	The Texel	53	03	N	26	00
	Amſterdam	52	21	N	25	50
	Roterdam	51	59	N	25	40
	The Brill	51	55	N	24	57
	Calice	51	00	N	23	05
Iſlands near the Coaſt of *Scotland.*	*Kilda Iſland*	58	02	N	12	50
	Lewis Iſland	58	30	N	13	30
	Fair Iſlands	61	43	N	14	50
	Shotland	60	22	N	18	30
	Iſles of Orkney	58	50	N	17	20
	Baſs Iſland	59	10	N	02	20
Coaſt of *Iſland.*	*Merchants Foreland*	63	36	N	02	10
	Langeneſs	67	20	N	06	10
	Snow Hill	65	40	N	15	00
Coaſt of *England* and *Scotland.*	*London*	51	32	N	21	00
	Buchaneſs	58	04	N	18	45
	Tinmouth	55	12	N	20	10
	Flamborough Head	54	10	N	21	08
	The Sporn	53	45	N	21	20
	Wintertonneſs	52	54	N	22	45
	Orfordneſs	52	24	N	22	40
	North Foreland	51	36	N	22	35
	South Foreland	51	13	N	22	30
	Dover	51	12	N	22	29
	Dungeneſs	51	00	N	22	08
	Iſle of Wight	50	37	N	19	20
	Portland	50	28	N	08	25
	The Start	50	10	N	06	55
	The Lizard	50	10	N	15	00
	Iſles of Silly	50	12	N	14	10

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Coast of Engl. & Scotland	*Londey's Isle*	51	18	N	16	15
	David's Head	52	05	N	15	35
	Bristol	51	28	N	18	15
Coast in the *Irish* Sea.	*Holy Head*	53	33	N	16	25
	Isle of Man	54	25	N	16	40
	Fair Foreland	55	15	N	14	30
	Black Rock	52	08	N	14	25
	Sline Head	53	02	N	12	00
	Blasques	52	03	N	11	25
	Cape Clear	51	03	N	12	00
	Old Head	51	28	N	12	30
	Dublin	53	20	N	14	30
Coast of *France*, *Spain*, and *Portugal*.	*Scyn Head*	49	50	N	21	20
	Cape Hage	49	55	N	18	35
	Garnsey	49	35	N	18	05
	Jersey	49	30	N	18	30
	Ushant	48	35	N	15	00
	Brest	48	30	N	15	10
	Bilboa	43	34	N	16	20
	Bourdeaux	45	30	N	19	30
	Cape Ortegal	44	04	N	11	40
	Cape Finisterre	43	06	N	90	30
	Lisbon	38	40	N	10	05
	Cape Vincent	37	00	N	09	50
	Straits of Gibralter	35	50	N	13	15
Sea Coasts in the *Straits*.	*Cape de Gata*	36	35	N	19	40
	Cape Martin	38	34	N	22	20
	Marsilles	43	20	N	26	40
	Genoa	44	27	N	31	00
	Rome	41	54	N	34	20
	Cape Sparteventura	37	34	N	37	15

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Sea-Coasts in the *Straits.*	*Cape Maria*	39	40	N	39	30
	Naples	41	05	N	36	12
	Angello	41	19	N	31	40
	Legorn	43	18	N	31	30
	Venice	45	20	N	35	11
	Cape Mapatan	36	00	N	46	40
	Scanderoon	36	56	N	49	00
	Cape Rusato	30	38	N	45	10
	Tunis	35	18	N	30	25
	Cape Tres forcas	35	28	N	19	00
	Tangier.	35	25	N	13	20
Islands in the *Straits.*	*Alboran*	37	53	N	19	15
	Formentara	38	45	N	24	40
	Ivica	39	06	N	23	00
	Majorca	39	39	N	24	30
	Minorca	39	56	N	25	50
	Cape Napoli in Sardinia	39	10	N	30	30
	Cape Corso in Corsica	42	52	N	31	20
	Limpadosa	55	59	N	33	50
	Malta	35	45	N	35	40
	Cape Passaro in Sicillia	36	33	N	36	20
	Messina	37	20	N	35	55
	Corfu	38	54	N	42	50
	Cephalonia	37	57	N	43	30
	Zant	36	42	N	43	40
	Cape Spudea in Candia	34	50	N	47	05
	Candia City	34	40	N	46	50
	Rhodes	34	45	N	50	50
	West end of Cyprus	33	27	N	54	10
	East end of Cyprus	33	53	N	57	35
	Smirna	38	40	N	50	10
	Constantinople	42	50	N	53	30
	Salonichi	40	30	N	45	10
	Alexandria	30	28	N	55	20
	Lepanto	37	30	N	44	30

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Coast of *Barbary* and *Guiny*.	*Cape Spartel*	35	41	N	012	20
	Cape Cantin	32	30	N	008	00
	Cape de Geere	29	56	N	006	38
	Cape de Non	28	30	N	005	49
	Cape Bojador	27	09	N	001	53
	Cape Blanco	20	30	N	359	11
	Cape Verde	14	26	N	359	00
	River Gamboa	13	00	N	000	41
	Cape Roco	11	41	N	000	30
	Cape Monte	05	40	N	004	00
	Cape Palmas	04	07	N	009	50
	Cape Tres Punctas	04	15	N	015	25
	Cape Corſe	04	20	N	016	30
	Cape Formoſa	04	20	N	024	25
	Thomas Iſland	00	10	N	026	05
	Cape Negro	16	00	S	029	55
	Cape Bona Eſperance.	34	30	S	037	15
Weſtern Iſlands.	*Flores*	39	39	N	347	37
	Fyal	38	55	N	349	30
	Georges	39	10	N	352	30
	Tercera	39	56	N	351	10
	The Eaſt end of St. Michaels	37	54	N	353	00
	St. Maries	37	15	N	353	10
	Gratioſa.	39	40	N	349	35
Canary Iſlands.	*Ferro*	27	38	N	357	55
	Palma	28	50	N	357	55
	Gomera	28	08	N	358	25
	Teneriff	28	42	N	000	00
	Medera	32	25	N	001	55
	Canaria	28	00	N	000	55
	Forteventura	28	06	N	003	41
	Lancerotto	28	30	N	004	35

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Cape de Verde Islands.	*Maio*	14	49	N	353	17
	Fogo	14	28	N	351	41
	Jago	14	40	N	352	35
	Sall	16	50	N	353	44
	Anabona	01	35	S	023	50
	Ascension	08	00	S	006	40
	Hellena	16	00	S	015	25
	Hellena Nova.	16	40	S	022	05
Coasts in the *East-Indies.*	*Cape Anguilloa*	34	58	S	38	50
	Cape Corrientes	23	36	S	54	30
	Cape Sebastian	22	40	S	56	25
	Sophala Isles	21	00	S	56	20
	Quilloa	08	55	S	61	30
	Cape Falco	08	30	S	61	40
	Pemba Island	05	38	S	61	32
	Magadoxa	02	35	N	64	43
	Socatora Isle	12	36	N	77	40
	Cape Dorfui	10	20	N	74	50
	Cape de Gardassin	12	15	N	74	55
	Cape Aden	13	14	N	71	00
	Cape Rasolgate	22	26	N	83	50
	Gulf de Persia	20	58	N	96	23
	Cape de Jasques	25	30	N	83	05
	Cape de Guadel	24	55	N	88	05
	Diul	24	32	N	92	25
	Cape Jaquack	22	40	N	92	55
	Surrat	21	10	N	97	30
	Bombay Isle	19	18	N	97	00
	Goa	15	40	N	97	55
	Cape Comorin	07	28	N	100	35
	River Bengale	21	45	N	111	43
	Jambes	01	05	N	123	40
	Siam	14	28	N	123	50
	Fort St. George	13	30	N	102	30
	Balasor	21	50	N	109	10

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Coasts in the *East-Indies.*	*Cape Liampo*	26	10	N	149	30
	Nanguſaque	32	00	N	150	05
	Canton in *China*	23	30	N	134	50
	Corea	35	40	N	146	00
Iſlands in the *East-Indies*	*St. Maria* at the South end of *Madagaſcar*	25	30	S	64	30
	St. Maria at the North end of *Madagaſcar*	12	14	S	69	30
	Diago Roiza	19	10	S	80	25
	Mauritius	20	10	S	75	30
	Muſcaenurus	21	36	S	73	40
	Timor	10	21	S	144	05
	The Weſt end of Java	06	15	S	123	05
	The Eaſt end of Java	07	45	S	132	10
	Bantam in *Java*	06	46	S	125	40
	Java	07	10	S	135	20
	Cambava	08	16	S	136	43
	Sunda Straits	06	00	S	125	23
	Achem at the North-Weſt Point of *Sumatra*	05	55	N	116	05
	The South end of *Sumatra*	05	55	S	125	01
	Ceram and *Amboina*	04	10	S	145	31
	Mecaſſar on the South end of *Celibes*	05	30	S	139	40
	Manado on the North end of *Celibes*	02	00	N	143	02
	The South end of *Gilolo*	01	35	S	146	42
	Naſſaw Iſle	00	00	N	118	15
	Tidore	00	36	N	144	05
	Saltadores	03	30	N	164	40
	Cape Aert on the Eaſt-ſide of *Borneo*	03	00	N	134	31
	Ouro	01	45	N	115	02
	Mindano City and Iſle	05	46	N	144	09

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Islands in the *East-Indies.*	*Batuba*	06	45	N	142	00
	Matan	08	40	N	163	20
	Cheraga	09	35	N	162	55
	Jaffanapatan Cape of Cylon	10	10	N	104	45
	Tandaia	12	40	N	112	11
	Mindora	13	24	N	140	00
	Malabrigo	18	30	N	163	15
	Aynam	19	15	N	129	40
	Formosa	23	34	N	139	35
	Meaco in *Japan*	36	00	N	155	10
	Jado in *Japan*	35	40	N	159	50
	Tandoxima by *Japan*	31	10	N	148	53
	Goto	32	40	N	147	08
	Firondo	33	15	N	150	00
	Straits of Zungaar.	40	30	N	160	30
Coast of *America* in the South-Sea.	*Cape Blanco*	42	04	N	234	40
	Port Drake	38	20	N	236	00
	Cape Barbara	36	25	N	243	00
	Cape St. Lucas	23	05	N	258	10
	Cape Corientes	20	23	N	265	30
	Cape Corientes	06	00	N	302	30
	Cape Blanco	03	46	S	304	50
	Ambrose Isles	25	54	S	301	25
	Baldivia	40	00	S	304	15
	Cofro	43	20	S	301	55
	Cape Victoria at the West entrance of *Magellan*	52	50	S	298	20
	Cape Virginia at the East entrance of *Magellan*	52	00	S	307	30
	Port Julian	48	30	S	308	20
	Cape Horn	57	50	S	304	10

Strait

	Places Names.	Latitude. D.	M.		Longit. D.	M.
The Coast of the Main Continent of *America.*	*Strait Lemaire*	55	26	S	310	00
	Port Desire	47	50	S	309	50
	Cape Antonio	36	18	S	320	10
	Cape Maria	35	10	S	320	05
	Cape Frio	23	12	S	343	00
	Paroibo	04	30	S	348	00
	Cape Blanco	02	20	S	343	15
	North Cape de Guiana	01	51	N	332	31
	Suranam	06	00	N	328	30
	Cape de Vela	12	10	N	310	20
	Numbre de Dios	09	42	N	302	30
	Panama	09	10	N	302	00
	Cape Gratius a Dios	14	10	N	299	30
	Cape de Catoch	21	14	N	295	10
	Le Vera Cruz	19	55	N	285	30
	Cape Florida	24	30	N	299	30
	Ashly River	33	00	N	301	50
	Cape Fair	34	08	N	302	50
	Cape Henry	37	06	N	305	50
	James Town	37	05	N	304	50
	Cape Hattaras	35	20	N	306	00
	Cape Charles	37	22	N	306	00
	Plymouth in *New-England*	42	00	N	315	30
	Cape Cod	41	50	N	316	40
	Cape Ann	42	15	N	316	00
	Isle of Sables	44	17	N	326	00
	Cape Britain	45	24	N	327	00
	Cape Raze	46	30	N	333	40
	Cape Bona Vista	50	03	N	333	25
	Bell Isle	52	09	N	330	30
	Charleton Isle in *James's-Bay.*	52	00	N	301	30

	°	′		
Cape Henlopen	38.	56	N	
Cape May	39	6	N	*Bermudus*

	Places Names.	Latitude. D.	M.		Longit. D.	M.
Islands in the *West-Indies.*	*Bermudus*	32	30	N	318	00
	Santa Cruz	17	42	N	320	00
	St. Christophers	17	30	N	321	00
	Antego	16	28	N	322	00
	Marigallanta	15	42	N	322	10
	Martineco	14	20	N	322	00
	Port Royal in *Jamaica*	17	50	N	304	15
	Barbadoes	13	24	N	323	30
	Tabago	10	54	N	324	20
	Trinidado	09	20	N	322	30
	Mevis	16	42	N	320	40
	Monserat	16	02	N	321	30
	Margaretta	11	00	N	319	30
	St. Domingo	18	30	N	313	05
	Cape Nicholas in *Hispaniola*	19	57	N	309	10
	Cape Roxo in Portereco	17	54	N	317	20
	Cape Antonio on *Cuba*	21	52	N	296	50
	Cape Crux on *Cuba*	19	40	N	302	30
	Cape Maye on *Cuba*	20	25	N	308	10
	The Havana on *Cuba*	23	28	N	299	04
	Isle of Ash.	18	20	N	309	20

The Explanation and Use of the Table of Latitude and Longitude.

IN the Table there are five Columns, The first shews the Sea-Coasts about the World in general; the second the particular Places; the third shews the Latitude; the fourth shews whether the Latitude be North or South; in which N stands for North, and S for South Latitude; the fifth and last shews the Longitude, being accounted Easterly from the Meridian of *Pico* on *Teneriff*.

The

To find the Latitnde and Longitnde of Places.

Suppoſe the Latitude and Longitude of *Silly* be deſired.

Look in the Table for the Coaſt of *England* in the firſt Column, and in the ſecond for *Silly*, over againſt which, in the third Column, ſtands 50° 12′ and in the fourth N, which ſhews the Latitude of *Silly* to be 50° 12′ North; the laſt Column gives 14° 10′, which is the Longitude from *Pico Teneriff* aforeſaid.

To find the Difference of Longitude between two Places.

Rule.

Firſt, Look out their Longitudes in the Table, ſubtract the leſſer Longitude out of the greater, and if the Remainder be leſs than 180°, that is the Difference of Longitude; but if it be more, ſubtract it from 360, and then the Remainder is the Difference of Longitude.

Example 1.

What is the Difference of Longitude between *Bermudus* and *Cape-Cod* in *New-England?*

The Longitude of *Bermudus* is	318° 00′
The Longitude of *Cape Cod* is	316° 40′
The Diff. of Longitude required	1° 20′

Example 2.

What is the Difference of Longitude between *Cape Cod* in *New-England* and the *Lizard?*

The Longitude of *Cape Cod*	316° 40′
The Longitude of the *Lizard*	15° 00′
Greater than 180°	291° 40′
Therefore ſubtract it from	360° 00′
The Diff. of Longitude required	068° 20′

To know whether the Difference of Longitnde between two places be Eaſterly or Weſterly.

Firſt, When the firſt Remainder is leſs than 180°, then being bound to the place that hath the leaſt Longitude, the Difference of Longitude is Weſterly; but if bound to the place that hath the greater Longitude, it is Eaſterly.

Secondly, When the ſaid firſt Remainder is greater than 180°, then if bound to the place, having the greater Longitude, the Difference of Longitude is Weſterly; if to that which hath the leſſer, it is Eaſterly.

Prob-

Problems of Plain Sailing, wrought both by the Logarithms, and by Gunter's Scale.

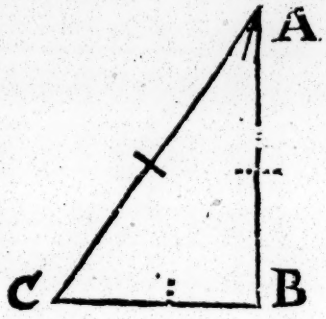
PROBLEM. I.

THE Course and Distance being given, to find the Difference of Latitude and Departure.

Example.

Suppose a Ship sail South-West by South 382 minutes, and it be required to find the Difference of Latitude and Departure.

In the Triangle A B C.
A C represent the Distance sailed.
A B the Difference of Latitude.
B C the Departure.
B A C (or the Angle at A) the Angle of the Course.
A C B (or the Angle at C) the Complement of the Course to 90°.



Characters used in Navigation, *and* Astronomy.

S. Stands for Sine.
T. For Tangent.
Sc. Sine Complement.
Tc. Tangent Complement.
The given Sides and Angles of a Triangle are marked with a Dash thus (')
The required Sides and Angles with pricks thus (⋮)

The Operation by the Logarithms, for the Difference of Latitude.

As Radius	10.00000
To the Distance sailed 382	2,58206
So is Sc. of the Course 56° 15'	9.91984
To the Difference of Latitude 317 required	2.50190

For the Departure.

As Radius	10.00000
To the Diſtance ſailed 382	2.58206
So is S. of the Courſe 33° 45′	9.74473
To the Departure which is 212	2.32679

The Operation by the Gunter's *Scale.*

For the Difference of Latitude.

One foot of the Compaſſes being in the Radius, (or Sine of 90 deg.) extend the other to the Sine of 56° 15′ the Complement of the Courſe, and the ſame extent ſhall reach the ſame way (*viz.* decreaſing) from the Diſtance 382, to the Difference of Latitude 317, which was required.

For the Departure.

The Extent of the Compaſſes from the Radius (or Sine of 90°) to the Sine of the Courſe 33° 45′, the ſame Extent ſhall reach (the ſame way) from the Diſtance 382 to the Departure, which is 212.

PROB. II.

The Courſe and Difference of Latitude given, to find the Diſtance and Departure.

Example.

Suppoſe a Ship ſail W. S. W. until the Difference of Latitude be 219, and the Diſtance and Departure required.

The Operation by the Logarithms.

For the Diſtance.

As Sc. of the Courſe 22° 30′	9.58283
To the Difference of Latitude 219	2.34044
So is Radius	10.00000
To the Diſtance, which is 572	2.75761

For the Departure.

As Radius	10.00000
To the Distance 572	2.75739
So is S. of the Course 67° 30′	9.96561
To the Departure, which is 528	2.72300

By the Gunter.

For the Distance.

The Compasses being extended from the Sc. of the Course 22° 30′ to the Radius, the same Extent shall reach the same way, (*viz.* increasing) from the Difference of Latitude 219, to the Distance, which is 572.

For the Departure.

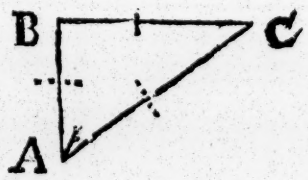
The Extent of the Compasses from Radius, to the S. of the Course 67° 30′, shall reach (the same way) from the Distance 572 to the Departure, which is 528.

PROB. III.

The Course and Departure given, to find the Distance and Difference of Latitude.

Example.

Suppose a Ship sail North-East by East until the Departure be 220, the Distance and Difference of Latitude required.



By the Logarithms.

For the Distance.

As S. of the Course 56° 15′	9.91984
To the Departure 220	2.34242
So is Radius	10.00000
To the Distance, which is 264	2.42258

For the Difference of Latitude.

As Radius	10.00000
To the Diſtance 264	2.42160
So is Sc. of the Courſe 33° 45′	9.74473
To the Difference of Latitude, which is 146	2.11633

By the Gunter.

For the Diſtance.

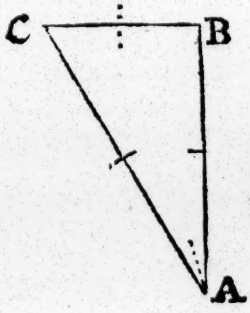
The Extent of the Compaſſes from the S. of the Courſe 56° 15′ to the Radius, ſhall reach (the ſame way) from the Departure 220, to the Diſtance, which is 264.

For the Difference of Latitude.

The Extent of the Compaſſes from Radius to the Sc. of the Courſe 33° 45′, ſhall reach from the Diſtance 246, to the Difference of Latitude 146 required.

PROB. IV.

The Diſtance and Difference of Latitude given, to find the Courſe and Departure.



Example.

Suppoſe a Ship ſail between the North and the Weſt, 206 min. until the Difference of Latitude be 197, the Courſe and Departure required.

By the Logarithms.

For the Courſe.

As the Diſtance 206	2.31386
To Radius	10.00000
So is the Difference of Latitude 197	2.29446
To the Sc. of the Courſe which is 17° N. W.	9.98060

For

For the Departure.

As Radius	10.00000
To the Diſtance, 206	2.31386
So is S. of the Courſe 17° 00′	9.46593
To the Departure 60	11.77979

By the Gunter.

For the Courſe.

The Extent from the Diſtance 206, to the Difference of Latitude 197, ſhall reach from Radius to the S. of 73° 00′, the Complement of the Courſe, which ſubtracted from 90, is the Courſe required.

For the Departure.

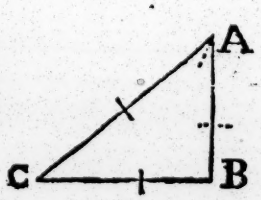
The Extent from Radius S. 90°, to the S. of the Courſe 17° 00′, ſhall reach from the Diſtance 206, to the Departure 60 required.

PROB. V.

The Diſtance and Departure given, to find the Courſe and Difference of Latitude.

Example.

Suppoſe a Ship ſail between the South and the Weſt 247 minutes, until her Departure be 197, and it be required to find her Courſe and Difference of Latitude.



The Operation by the Logarithms.

For the Courſe.

As the Diſtance, 247	2.39269
To Radius	10.00000
So is the Departure 197	2.29446
To the S. of the Courſe, which is 52°. 54′	9.90177

For the Difference of Latitude.

As Radius	10.00000
To the Diſtance 247	2.39269
So is Sc. of the Courſe 37° 06′	9.78046
To the Difference of Latitude, which is 149	2.17315

By the Gunter.

For the Courſe.

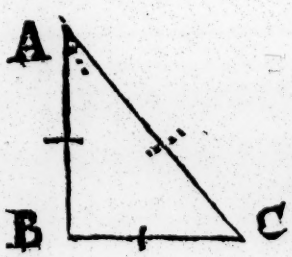
The Extent of the Compaſſes from the Diſtance 247, to the Departure 197, ſhall reach the ſame way from Radius S. 90°, to the S. of the Courſe, which is 52° 54′.

For the Difference of Latitude.

The Extent of the Compaſſes from Radius S. 90°, to the Sc. of the Courſe 37° 6′, will reach from the Diſtance 247 to the Difference of Latitude, which is 149.

PROB. VI.

The Difference of Latitude and Departure given, to find the Courſe and Diſtance.



Example.

Suppoſe a Ship ſail between the South and the Eaſt, until her Difference of Latitude be 210′, her Departure 200, and it be required to find the Courſe and Diſtance.

The Operation by the Logarithms.

For the Courſe.

As the Difference of Latitude 210′	2.32221
To Radius	10.00000
So is the Departure 200	2.30103
To the T. of the Courſe 43° 36′ required.	9.97882

For

For the Distance.

As the Sc. of the Course 46° 24′	9.85984
To the Difference of Latitude 210	2.32221
So is Radius	10.00000
To the Distance, which is 290	2.46237

By the Gunter.

For the Course.

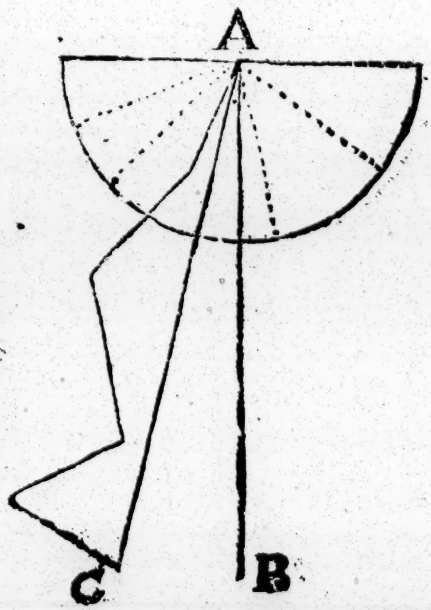
The Extent of the Compasses from the Difference of Latitude 210, to the Departure 200, shall reach from Radius in the Tangents, which is the Tangent of 45°, to the Tangent of the Course, which is 43° 36′.

For the Distance.

The Extent from the Sc. of the Course 46° 24′, to the Radius of the Sine of 90° will reach from the Difference of Latitude 210, to the Distance, which is 290.

PROB. VII.

This Problem shews the manner of working a Traverse, and is very useful in keeping a Reckoning by Plain Sailing.



Example.

Suppose a Ship bound to a certain Port, and she sails thither S. S. W. 40 minutes, then S. W. 60 min. then South by East 63 min. W. S. W. 49 min. then S. E. by South 56 min. and the Difference of Latitude and Departure the Ship hath made, with the direct Course and Distance is required.

The

The Operation by the Logarithms.

For the Difference of Latitude for the first Course.

As Radius	10.00000
To the Distance, 40	1.60006
So is Sc. of the Course 67° 30′	9.96561
To the Difference of Latitude, 36	✗1.56567

For the Departure for the first Course.

As Radius	10.00000
To the Distance 40	1.60006
So is S. of the Course 22° 30′	9.58283
To the Departure 15 required.	✗1.18289

By the Gunter.

For the Difference of Latitude.

The Extent of the Compasses from Radius S. 90°, to the Sc. of the Course 67° 30′, will reach from the Distance 40, to the Difference of Latitude 36 required.

For the Departure.

The Extent from Radius S. 90°, to the Sc. of the Course 22° 30′, shall reach from the Distance 40, to the Departure 15 required.

In the same manner proceed to find the Difference of Latitude and Departure for each Course: which being found, place in a Table as follows.

The

The Traverse Table.

Courses.	Dist.	North.	South.	East.	West.
South South-West—	40		36—		15-
South West	60		42—		42—
South by East	63		61—	12-	
West South-West	49		18—		45—
South-East by South	56		46—	31-	
			203-	43-	102—
					43—
					59—

The Explanation of the Table.

For the placing the Difference of Latitude and Departure in their proper Columns, observe, That if the Course be North, the Difference of Latitude is put into the North Column: if it be South, in the South Column: and if the Course be Easterly, the Departure is put in the East Column; if Westerly, in the West Column.

Thus having framed the Table, add up the North, South, East and West Columns, whereby the difference of Latitude appears to be 203 minutes South, because there's nothing in the North Columns; the Departure 59 minutes West, because so much the West Column exceeds the East; by which Difference of Latitude and Departure, find the direct Course and Distance as follows.

The Operation by the Logarithms.

For the direct Course.

As the difference of Latitude 203 ——— 2.30749
To Radius ——— 10.00000
So is the Departure 59 ——— 1.77085
To the T. of the Course 16° 12′ South-West, because the South and West Columns exceed the North and East ——— 9.46336

For the direct Distance.

As Sc. of the Course 73° 48′ ——— 9.98240
To the Difference of Latitude 203 ——— 2.30749
So is Radius ——— 10.00000
To the Distance required, which is 211. ——— 2.32509

By the Gunter.

For the direct Course.

The Extent of the Compasses from the Difference of Latitude 203, to the Departure 59, shall reach from Tang. 45° (or Radius) to the Tang. of 16° 12′, the Course required.

For the direct Distance.

The Extent from the Sc. of the Course 73° 48′, to S. of 90°, (*viz.* Radius) shall reach from the Difference of Latitude 203, to the Distance 211 required.

Oblique-angled Plain Triangles, applied in PROBLEMS *of Plain Sailing, and wrought both by the* Logarithms *and* Gunter's *Scale.*

PROBLEM I.

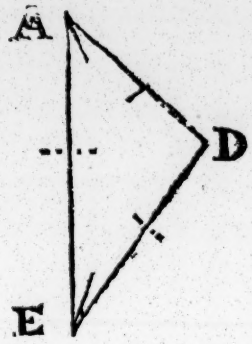
THE Angles and one of the Sides given, to find either of the other Sides.

Example.

Suppose there are two Ports both under one Meridian: A Ship sails from the Northermost South-East 206 min. another Ship sails from the Southermost North-East by North, a certain number of minutes, and meets with the first Ship: The distance between these two Ports, and the distance sailed by the second Ship, are required.

In

In the Triangle ADE.



A and E repreſent the two Ports.
A D the firſt Ship's Diſtance.
E D the ſecond Ship's Diſtance.
A E the diſtance between the two Ports.

The Operation by the Logarithms.

For the Diſtance between the two Ports.

	Co. Ar.
As S. A E D the ſecond Ship's Courſe 33° 45′	0.25527
To A D the firſt Ship's Diſtance 206	2.31386
So is S. A D E 101° 15′	9.99157
To A E the diſtance between the two Ports 363.	*r*2.56070

In this Operation, to ſave the labour of the Subtraction, uſe the Complement Arithmetical of the firſt Logarithm, which is found by ſubtracting each figure of the Logarithm found in the Table from 9, ſave the firſt towards the right Hand, which is ſubtracted from 10, as in the Operation the Logarithm Sine found in the Table is 974473: wherefore beginning at the left Hand, ſay; 9 from 9, there remains 0; 7 from 9, remains 2; 4 from 9, remains 5; 4 from 9, remains 5; 7 from 9, remains 2; and laſtly, 3 from 10, and there remains 7: So the Complement Arithmetical of the firſt Logarithm, is 0.25527, as it ſtands in the Operation.

For the ſecond Ship's Diſtance.

	Co. Ar.
As S. A E D the ſecond Ship's Courſe 33° 45′	0.25527
To A D the firſt Ship's Diſtance 206′	2.31386
So is S. D A E the firſt Ship's Courſe 45° 00′	9.84948
To D E the ſecond Ship's Diſt. 262 required.	*r*2.41861

By the Gunter.

For the Diſtance between the two Ports.

The Extent of the Compaſſes from the S. of 33° 45′ the firſt Ship's Courſe, to S. A D E 78° 45′, (*viz.* the Complement of 101° 15′ to 180°)

180°) ſhall reach from 206 the firſt Ship's diſtance, to 363 the diſtance between the two Ports required.

For the ſecond Ship's diſtance.

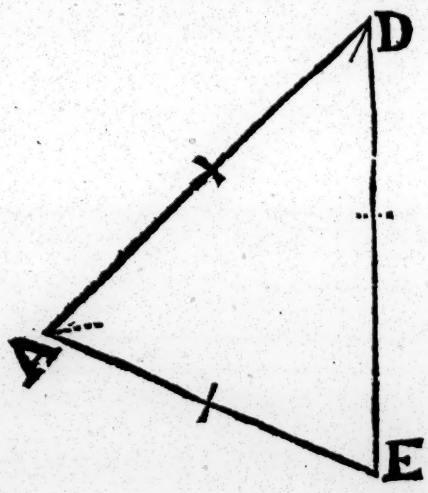
. The Extent of the Compaſſes from the S. 33° 45′ the firſt Ships Courſe, to the S. of 45° 00′ the ſecond Ship's Courſe, ſhall reach from 206 the firſt Ship's diſtance, to 262 the ſecond Ships diſtance required.

PROB. II.

Two Sides and an Angle oppoſite to one of them being given, to find the other oppoſite Angle, and the third Side.

Example

Suppoſe two Ports, whoſe bearing is North-Eaſt and South-weſt, diſtant 396 min. a Ship at the Northermoſt ſails S. S. E. and another Ship as the Southermoſt ſails thence 518 min. and meets with the firſt Ship: The Courſe ſailed by the ſecond Ship, and the firſt Ships diſtance are required.



In the Triangle A D E.

A and D repreſent the two Ports.

A D the diſtance between them.

D E the diſtance ſailed by the firſt Ship.

A E the diſtance ſailed by the ſecond Ship.

The Operation by the Logarithms.

For the ſecond Ship's Courſe.

	Co. Ar.
As A E the ſecond Ship's diſtance 518	7.28568
To S. A D E the firſt Ship's Courſe 67° 30′	9.96561
So is A D the diſtance between the two Ports 396	2.59769
To S. A E D 44° 56′	19.84898

Now

Now the Angle at D 67° 30′, and the Angle at E 44° 56′ being added together, and ſubtracted from 180°, gives 67° 34′, which makes neareſt 6 Points: and 6 Points reckoned from the North-Eaſt to the Southward, gives E. S. E. the ſecond Ships Courſe required.

For the firſt Ships diſtance.

	Co. Ar.
As S. A D E the firſt Ships Courſe 67° 30′	0.03439
To A E the ſecond Ships diſtance 518	2.71432
So is S. D A E the ſecond Ships Courſe 44° 56′	9.84897
To D E the firſt Ships diſtance 395 required.	*x* 2.59768

By the Gunter.

For the ſecond Ships Courſe.

The Extent of the Compaſſes from the diſtance 518, to the diſtance between the two Ports 396, ſhall reach from S. of 67° 30′, the firſt Ships Courſe, to S. 44° 56′, which added to the Angle at D, and the Sum ſubtracted from 108°, gives 67° 34′ the ſecond Ships Courſe.

For the firſt Ships Diſtance.

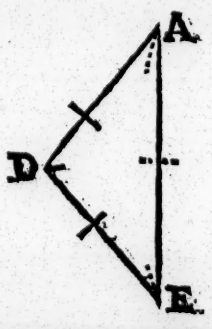
The Extent from S. of 67° 30′ the firſt Ships Courſe, to 44° 56′ ſhall reach from the ſecond Ships Diſtance 518, to the firſt Ships Diſtance 395 required.

PROB. III.

Two Sides and the contained Angle given, to find the other Angles.

Example.

Suppoſe two Ships ſail from one Port; one ſails North-Eaſt 140 minutes, the other South-Eaſt by Eaſt 115 min. The Bearing and Diſtance of theſe two Ships is required.



Let D repreſent the Port, D A the firſt Ships Diſtance, and D E the ſecond.

The

The Operation by the Logarithms.

For the bearing of the two Ships.

	Co. Ar.
As the Sum of the Sides A D and D E 255	7.59346
To the difference of the ſaid Sides 25	1.39794
So is the T. of ½ the Sum of their oppoſite Angles 50° 37′	10.08569
To the T. of ½ their difference, which is 6° 48′	*x* 9.07709

The ½ difference added to the ½ ſum, gives 57° 25′, the greater Angle. The ½ difference ſubtracted from it, gives 43° 49′, the leſſer Angle: Wherefore the bearing of the two Ships is North-Eaſterly, or South-Weſterly 1° 11′.

For the Diſtance of the Ships.

	Co. Ar.
As S. A E D 57° 25′	0.07438
To A D the firſt Ship's diſtance 140	2.14612
So is S. A D E 78° 45′.	9.99157
To A E the diſtance of the Ships 163 *fere.*	*x* 2.21207

By the Gunter.

For the bearing of the Ships.

The Extent of the Compaſſes from the ſum of the Sides 255, to to their difference 25, ſhall reach from the T. of the half-ſum of the required Angles 50° 37′, to the T. of half the difference of the ſaid Angles 6° 48′.

In the foregoing Operation by the *Gunter*, the Practitioner may be at a loſs, becauſe in extending the Compaſſes from the T. of 50° 37′ decreaſing, they will fall beyond the T. of 45° at the end of the Line. To remedy this, place the Extent (from 255 to 25) from the T. 45°, and it will reach to the T. of 50. 37; then letting one Point ſtand at 5. 36. extend the other to the T. 50. 37. This Extent placed from the T. 45. ſhall fall on the T. 6. 48. required.

For

For the distance of the Ships.

The Extent of the S. of 57 deg. 25 min. to the S. 78 deg. 45 min. shall reach from 140 to 163 required.

PROB. IV.

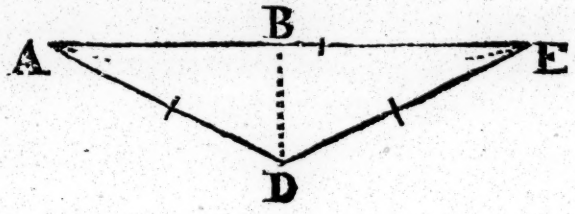
Three Sides being given, to find an Angle.

Example.

Suppose there are two Ports both in one Latitude, distant 536 min. a Ship sails from the Eastermost 306 min. between the South and the West: another Ship sails from the Westermost 290 min. and meets with the first Ship: the Course that each Ship steered is required.

Let A and E represent the two Ports, D the place where the Ships meet.

This Question is easiest resolved, by letting fall the Perpendicular D B, so reducing the Oblique-Triangle A D E, into the two Right-angled Triangles A B D and B D E, then the Operation is as follows.



The Operation by the Logarithms.

First, Find the Segment of the Base B E, thus:

	Co.Ar.
As the Base A E 536	7.27084
To the sum of the Sides A D and E D 596	2.77524
So is the difference of the said Sides 16	1.20412
To a Segment of the Base, which is 17	*X* 1.25020

The whole Base is	536
The Segment is	17
Sum	553
Half-sum	276 $\frac{5}{10}$ is the greater Segment B E.

Then

Then ſay, *For the firſt Ships Courſe.*

As D E the firſt Ships diſtance 306 ——— 2.48572
To Radius ——— 10.00000
So is the greater Segment B E 276 ——— 2.44090
To S. 64° 25′ the Compl. of the Courſe required. ——— 9.95518

The firſt Ship ſteers Weſt 25° 35′ South, or S. W. by W. ¾ W. *fere.*

For the ſecond Ships Courſe.

As A D the ſecond Ships diſtance 290 ——— 2.46239
To the Radius ——— 10.00000
So is the leſſer Segment A B 260 ——— 2.41497
To S. 63° 42′ the Compl. of the Courſe required. ——— 9.95258

The ſecond Ship ſteers Eaſt 26° 18′ South, or S.E. by E. ¾ Eaſt *ferè.*

By the Gunter.

For the Segment of the Baſe.

The Extent of the Compaſſes from the Baſe A E 536, to the ſum of the Sides 596, ſhall reach from the difference of the Sides 16, to the Segment of the Baſe 17, with which proceed as before.

For the firſt Ships Courſe.

The Extent from the Diſtance 306, to the greater Segment 276, ſhall reach from Radius S. 90° to S. 64° 25′, the Complement of the Courſe required.

For the ſecond Ships Courſe.

The Extent from the Diſtance 290 to the leſſer Segment 260, ſhall reach from Radius S. 90° to S. 63° 42′, the Complement of the Courſe required.

A Large and very Useful

TABLE

OF

DIFFERENCE

OF

Latitude & Departure,

IN

Minutes and Tenth Parts, to every *Degree* and *Quarter-Point*

OF THE

COMPASS:

For the Exact Working

OF A

TRAVERS.

London, Printed by *John Darby* for *William Fisher*, at the Postern-Gate near *Tower-Hill*.

Dist.	1 Deg.		2 Deg.		¼ Point.		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	01·0	00·0	01·0	00·0	01·0	00·0	01·0	00·0	01·0	00 1	01·0	00 1	1
2	02 0	00·0	02·0	00·1	02·0	00·1	02·0	00·1	02·0	00·1	02·0	00 2	2
3	03·0	00·1	03·0	00·1	03·0	00·1	03·0	00·2	03 0	00 2	03·0	00·3	3
4	04·0	00·1	04 0	00 1	04 0	00·2	04·0	00·2	04·0	00·3	04·0	00·3	4
5	05·0	00·1	05·0	00·2	05·0	00·2	05·0	00·3	05·0	00·3	05·0	00 4	5
6	06·0	00·1	06 0	00·2	06 0	00·3	06·0	00·3	06·0	00·4	06 0	00·5	6
7	07·0	00·1	07·0	00·2	07·0	00·3	07·0	00·4	07·0	00 5	07·0	00 6	7
8	08·0	00·1	08·0	00·3	08·0	00·4	08 0	00·4	08·0	00.6	08·0	00·7	8
9	09·0	00·2	09·0	00·3	09 0	00·4	09 0	00·5	09·0	00·6	09·0	00·8	9
10	10.0	00.2	10·0	00.4	10·0	00 5	10·0	00·5	10·0	00·7	10·0	00·9	10
11	11 0	00.2	11·0	00·4	11·0	00 5	11·0	00 6	11·0	00 8	11·0	01·0	11
12	12.0	00·2	12 0	00·4	12·0	00.6	12.0	00 6	12 0	00.8	12·0	01·0	12
13	13·0	00·2	13.0	00.5	13 0	00.6	13·0	00·7	13·0	00·9	12·9	01·1	13
14	14·0	00.2	14.0	00 5	14·0	00 7	14·0	00.7	14.0	01·0	13 9	01 2	14
15	15·0	00·3	15 0	00 5	15·0	00·7	15.0	00·8	15 0	01·0	14·9	01·3	15
16	16.0	00.3	16 0	00.6	16·0	00.8	16.0	00.8	16·0	01 1	15·9	01·4	16
17	17.0	00 3	17.0	00.6	17·0	00.8	17.0	00.9	17·0	01·2	16 9	01·5	17
18	18·0	00.3	18 0	00.6	18·0	00·9	18 0	00 9	17·9	01·3	17 9	01·6	18
19	19.0	00.3	19.0	00·7	19·0	00.9	19·0	01.0	18.9	01·3	18·9	01·7	19
20	20.0	00.4	20·0	00·7	20 0	01·0	20.0	01·0	19 9	01·4	19·9	01·7	20
21	21·0	00·4	21 0	00·7	21.0	01·0	21 0	01·1	20.9	01 5	20.9	01.8	21
22	22.0	00·4	22.0	00.8	22.0	01·1	22.0	01·1	21 9	01 5	21·9	01.9	22
23	23·0	00·4	23·0	00.8	23·0	01·1	23·0	01·2	22.9	01.6	22.9	02·0	23
24	24 0	00 4	24.0	00.8	24·0	01·2	24·0	01·3	23 9	01·7	23·9	02.1	24
25	25·0	00·4	25·0	00.9	25·0	01·2	25·0	01.3	24 9	01.7	24.9	02.2	25
26	26.0	00.5	26·0	00 9	26·0	01.3	26 0	01·4	25·9	01·8	25·9	02.3	26
27	27.0	00.5	27 0	00·9	27.0	01·3	27·0	01·4	26.9	01·9	26.9	02.4	27
28	28.0	00·5	28·0	01·0	28·0	01·4	28·0	01.5	27·9	02·0	27·9	02·4	28
29	29.0	00.5	29.0	01.0	29 0	01·4	29.0	01·5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30·0	01·1	30·0	01·5	30·0	01·6	29 9	02.1	29.9	02 6	30
31	31.0	00.5	31.0	01.1	30·9	01·5	31.0	01·6	30·9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01·1	31·9	01.6	31 9	01·7	31·9	02·2	31 9	02.8	32
33	33.0	00 6	33·0	01·2	32·9	01.6	32.9	01.7	32.9	02·3	32.9	02.9	33
34	34.0	00.6	34.0	01·2	33·9	01.7	33·9	01.8	33·9	02.4	33·9	03.0	34
35	35·0	00.6	35.0	01·2	34·9	01·7	34·9	01·8	34·9	02·4	34 9	03·1	35
36	36·0	00.6	36·0	01·3	35.9	01.8	35 9	01 9	35 9	02.5	35 9	03.1	36
37	37·0	00.7	37.0	01·3	36·9	01·8	36.9	01·9	36·9	02.6	36 9	03·2	37
38	38.0	00 7	38·0	01·3	37.9	01·9	37 9	02.0	37 9	02.7	37 9	03.3	38
39	39·0	00 7	39.0	01·4	38 9	01 9	38·9	02.0	38 9	02.7	38.9	03.4	39
40	40·0	00.7	40 0	01·4	39.9	02.0	39·9	02.1	39·9	02.8	39·8	03.5	40
41	41 0	00.7	41.0	01·4	40.9	02.0	40 9	02 1	40 9	02 9	40.8	03.6	41
42	42.0	00 7	42.0	01·5	41·9	02·1	41 9	02.2	41·9	02·9	41·8	03·7	42
43	43·0	00.8	43·0	01·5	42.9	02.1	42·9	02.2	42·9	03 0	42·8	03·8	43
44	44·0	00 8	44 0	01·5	43 9	02 2	43·9	02·3	43·9	03 1	43·8	03·8	44
45	45·0	00.8	45·0	01.6	44.9	02·2	44·9	02 4	44·9	03 1	44.8	03·9	45
46	46.0	00·8	46 0	01·6	45·9	02.2	45·9	02 4	45 9	83.2	45.8	04.0	46
47	47·0	00.8	47 0	01.6	46·9	02·3	46.9	02·5	46·9	03·3	46.8	04·1	47
48	48·0	00.8	48.0	01 7	47·9	02.3	47·9	02.5	47·9	03.4	47·8	04 2	48
49	49.0	00·9	49.0	01.7	48.9	02·4	48·9	02.6	48·9	03 4	48 8	04 3	49
50	50.0	00.9	50.0	01.8	49 9	02 4	49·9	02.6	49·9	03·5	49·8	04 4	50
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	89 Deg.		88 Deg.		7 ¾ Poin		87 Deg.		86 Deg.		85 Deg.		

Diff.	1 Deg. Lat.	1 Deg. Dep	2 Deg. Lat.	2 Deg. Dep	¼ Point. Lat.	¼ Point. Dep	3 Deg. Lat.	3 Deg. Dep	4 Deg. Lat.	4 Deg. Dep	5 Deg. Lat.	5 Deg. Dep	Diff.
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.5	51.3	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.6	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.9	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.1	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.8	04.1	58.8	05.2	59
60	60.0	01.0	60.0	02.1	59.9	02.9	59.9	03.1	59.8	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.8	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.3	61.8	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.4	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.7	05.7	65
66	66.0	01.1	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.9	67
68	68.0	01.2	67.9	02.4	67.9	03.3	67.9	03.6	67.8	04.8	67.7	05.9	68
69	69.0	01.2	68.9	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	69.9	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	70.9	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	71.9	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	72.9	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	73.9	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	74.9	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.6	75
76	76.0	01.3	75.9	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	76.9	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	77.9	02.7	77.9	03.8	77.9	04.1	77.8	05.5	77.7	06.8	78
79	79.0	01.4	78.9	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	79.9	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	80.9	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.4	82.9	02.9	82.9	04.1	82.9	04.4	82.8	05.8	82.7	07.3	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.5	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.2	87.7	07.7	88
89	89.0	01.5	88.9	03.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.6	04.4	89.9	04.7	89.8	06.3	89.7	07.9	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	08.0	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.6	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.9	97.6	08.6	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.7	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Diff.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Diff.
	89 Deg.		88 Deg.		7 ¾ Poin		87 Deg.		86 Deg.		85 Deg.		

Dist.	½ Point.		6 Deg.		7 Deg.		8 Deg.		¾ Point.		9 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	01·0	00·1	01·0	00·1	01·0	00·1	01·0	00·1	01·0	00 1	01·0	00 2	1
2	02·0	00·2	02·0	00·2	02·0	00·2	02·0	00·3	02·0	00·3	02·0	00 3	2
3	03 0	00·3	03·0	00·3	03 0	00 4	03·0	00·4	03·0	00 4	03·0	00·5	3
4	04·0	00·4	04·0	00 4	04 0	00·5	04·0	00·6	04.0	00 6	03·9	00·6	4
5	05·0	00·5	05·0	00·5	05·0	00 6	04·9	00·7	04·9	00.7	04·9	00·8	5
6	06·0	00.6	06 0	00.6	06.0	00.7	05·9	00·8	05·9	00.9	05 9	00.9	6
7	07·0	00.7	07 0	00.7	06 9	00.8	06.9	01.0	06·9	01.0	06 9	01·1	7
8	08.0	00.8	08·0	00.8	07·9	01 0	07·9	01·1	07·9	01·2	07.9	01.2	8
9	09·0	00·9	08·9	00·9	08.9	01·1	08 9	01.2	08.9	01 3	08.9	01·4	9
10	09·9	01.0	09.9	01.0	09·9	01 2	09·9	01·4	09 9	01·5	09·9	01 6	10
11	10.9	01.1	10·9	01.1	10·9	01·3	10·9	01·5	10.9	01.6	10·9	01.7	11
12	11·9	01·2	11·9	01·2	11 9	01·5	11·9	01.7	11·9	01·8	11.8	01.9	12
13	12.9	01·3	12·9	01·4	12·9	01.6	12.9	01.8	12 9	01.9	12.8	02 0	13
14	13·9	01.4	13.9	01·5	13 9	01.7	13·9	01.9	13.8	02.1	13·8	02.2	14
15	14·9	01·5	14.9	01.6	14 9	01·8	14.8	02.1	14.8	02 2	14.8	02.3	15
16	15·9	01 6	15·9	01.7	15·9	01·9	15.8	02·2	15 8	02·3	15.8	02.5	16
17	16.9	01·7	16 9	01.8	16·9	02 1	16.8	02.4	16·8	02 5	16 8	02.7	17
18	17.9	01.8	17.9	01·9	17·9	02·2	17.8	02.5	17 8	02.6	17·8	02.8	18
19	18 9	01.9	18·9	02.0	18·9	02.3	18.8	02.6	18.8	02·8	18.8	03.0	19
20	19.9	02.0	19.9	02·1	19·8	02 4	19 8	02 8	19 8	02 9	19.7	03·1	20
21	20.9	02·1	20·9	02.2	20 8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21·9	02.2	21 9	02.3	21.8	02.7	21 8	03·1	21 8	03·2	21·7	03·4	22
23	22.9	02 2	22.9	02.4	22.8	02·8	22.8	03.2	22.7	03.4	22.7	03.6	23
24	23·9	02 3	23·9	02 5	23 8	02.9	23·8	03·3	23 7	03 5	23·7	03·8	24
25	24 9	02.4	24.9	02.6	24·8	03.0	24·8	03·5	24 7	03·7	24.7	03·9	25
26	25·9	02.5	25·9	02·7	25·8	03 2	25 7	03·6	25·7	03·8	25·7	04 1	26
27	26 9	02.6	26·9	02.8	26 8	03·3	26 7	03·7	26.7	04 0	26.7	04.2	27
28	27·9	02·7	27 8	02 9	27.8	03·4	27·7	03.9	27 7	04·1	27.6	04·4	28
29	28.9	02.8	28·8	03.0	28.8	03·5	28·7	04·0	28.7	04·2	28.6	04 5	29
30	29.8	02.9	29.8	03·1	29 8	03·7	29.7	04.2	29·7	04·4	29.6	04.7	30
31	30.8	03.0	30·8	03 2	30·8	03 8	30·7	04 3	30.7	04·5	30.6	04.9	31
32	31.8	03·1	31·8	03·3	31·8	03 9	31 7	04·4	31 6	04·7	31·6	05·0	32
33	32·8	03 2	32·8	03·4	32·7	04·0	32·7	04.6	32.6	04.8	32.6	05 2	33
34	33·8	03·3	33·8	03·5	33·7	04·1	33·7	04·7	33·6	05.0	33·6	05.3	34
35	34.8	03·4	34·8	03·7	34 7	04·3	34·7	04·9	34.6	05.1	34 6	05 5	35
36	35·8	03·5	35·8	03.8	35·7	04·4	35 6	05·0	35 6	05·3	35 5	05.6	36
37	36·8	03.6	36·8	03·9	36·7	04.5	36.6	05·1	36.6	05.4	36 5	05.8	37
38	37·8	03 7	37.8	04.0	37·7	04.6	37·6	05·3	37 6	05 6	37·5	06·0	38
39	38·8	03·8	38·8	04·1	38 7	04.8	38·6	05·4	38 6	05·7	38.5	06·1	39
40	39·8	03.9	39.8	04.2	39·7	04.9	39·6	05·6	39·6	05 9	39·5	06·3	40
41	40·8	04.0	40 8	04·3	40·7	05 0	40 6	05·7	40 6	06.0	40.5	06.4	41
42	41·8	04 1	41·8	04·4	41·7	05·1	41 6	05.8	41·5	06.2	41·5	06.6	42
43	42.8	04.2	42.8	04·5	42.7	05.2	42·6	06.0	42·5	06.3	42·5	06·7	43
44	43·8	04 3	43·7	04·6	43 7	05.4	43·6	06 1	43·5	06.5	43·5	06.9	44
45	44·8	04.4	44·7	04.7	44·7	05·5	44·6	06.3	44·5	06.6	44.4	07.0	45
46	45·8	04·5	45·7	04 8	45·7	05.6	45·5	06.4	45·5	06·7	45·4	07 2	46
47	46.8	04.6	46 7	04.9	46.6	05 7	46·5	06.5	46·5	06·9	46.4	07·3	47
48	47·8	04.7	47·7	05·0	47·6	05·9	47·5	06·7	47·5	07.0	47·4	07·5	48
49	48·8	04 8	48·7	05·1	48.6	06.0	48 5	06·8	48·5	07·2	48 4	07·7	49
50	49.8	04.9	49·7	05.2	49·6	06·1	49·5	07·0	49·5	07·3	49·4	07·8	50
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	7 ½ Poin		84 Deg.		83 Deg.		82 Deg.		7 ¼ Poin		81 Deg.		

Dist.	½ Point.		6 Deg.		7 Deg.		8 Deg.		¾ Point.		9 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
51	50.7	05.0	50.7	05.3	50.6	06.2	50 5	07.1	50 4	07.5	50.4	08 0	51
52	51.7	05.1	51.7	05.4	51.6	06 3	51.5	07.2	51.4	07 6	51.4	08.1	52
53	52.7	05 2	52.7	05.5	52.6	06.5	52.5	07.4	52 4	07 8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06 6	53.5	07 5	53.4	07 9	53.3	08 4	54
55	54.7	05 4	54 7	05 8	54.6	06.7	54.5	07.6	54 4	08.1	54.3	08 6	55
56	55 7	05 5	55.7	05.8	55.6	06 7	55.5	07.8	55 4	08.2	55.3	08.7	56
57	56.7	05.6	56.7	06 0	56.6	06.9	56 4	07 9	56.4	08.4	56 3	08 9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08 1	57 4	08.5	57 3	09.1	58
59	58.7	05.8	58 7	06 2	58.6	07.2	58 4	08.2	58.4	08.7	58 3	09 2	59
60	59.7	05 9	59.7	06.3	59 5	07.3	59.4	08.3	59.3	08 8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08 9	60.2	09.5	61
62	61.7	06.1	61.6	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09 7	62
63	62.7	06 2	62.6	06 6	62.5	07.7	62.4	08.8	62.3	09 2	62.2	09 9	63
64	63.7	06.3	63.6	06.7	63.5	07 8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64 7	06.4	64.6	06.8	64.5	07 9	64 4	09.1	64 3	09.5	64 2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09 2	65 3	09 7	65.2	10 3	66
67	66.7	06 6	66.6	07.0	66.5	08 2	66 3	09.3	65 3	09.8	66 2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08 3	67 3	09 5	67 3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.2	10 1	68 1	10 8	69
70	69.7	06.9	69.6	07.3	69 5	08 5	69.3	09 7	69.2	10.3	69.1	10 9	70
71	70 6	07.0	70.6	07.4	70 5	08.7	70 3	09 9	70.2	10.4	70.1	11 1	71
72	71.6	07.1	71 6	07.5	71.5	08.8	71 3	10 0	71.2	10.6	71.1	11.3	72
73	72.6	07.1	72.6	07.6	72.4	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.2	73.6	07.7	73.4	09.0	73.3	10.3	73 2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07 8	74 4	09.1	74.3	10 4	74 2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10 6	75 2	11.1	75.1	11.9	76
77	76.6	07 5	76.6	08.0	76.4	09.4	76.2	10 7	76 2	11.3	76.0	12.0	77
78	77.6	07.6	77.6	08 1	77.4	09 5	77.2	10.9	77.1	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09 6	78 2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07 8	79.6	08.4	79.4	09.8	79.2	11.1	79 1	11 7	79.0	12 5	80
81	80.6	07.9	80.5	08 5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81 1	12 0	81.0	12.8	82
83	82 6	08.1	82.5	08.7	82.4	10.0	82.2	11 5	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08 8	83.4	10 1	83.2	11 7	83 1	12.3	83 0	13.1	84
85	84 6	08 3	84.5	08 9	84.4	10.3	84.2	11.8	84.1	12.5	83 9	13.3	85
86	85 6	08.4	85.5	09.0	85.4	10.4	85 2	12.0	85.1	12.6	84.9	13 4	86
87	86.6	08.5	86 5	09.1	86.3	10.5	86.2	12.1	86.0	12 8	85.9	13.6	87
88	87.6	08 6	87.5	09.2	87.3	10.7	87.1	12 2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.9	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14 1	90
91	90.6	08.9	90.5	09 5	90.3	11.1	90.1	12.7	90.0	13 4	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13 5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92 3	11.3	92.1	12.9	92.0	13.6	91.8	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11 5	93.1	13 1	93 0	13.8	92.8	14.7	94
95	94.5	09 3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95 1	13.4	95.0	14.1	94.8	15.0	96
97	96 5	09.5	96.5	10.1	96.3	11 8	96.0	13.5	95.9	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	12.0	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09 7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99 2	12.2	99.0	13.9	98.9	14 7	98.8	15.6	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	7 ½ Poin		84 Deg.		83 Deg.		82 Deg.		7 ¼ Poin		81 Deg.		

Diff.	10 Deg.		11 Deg.		1 Point.		12 Deg.		13 Deg.		14 Deg.		Diff.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	02.9	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.1	04.8	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.8	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	01.9	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.5	03.6	15
16	15.7	02.8	15.7	03.0	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	02.9	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.6	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.2	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.4	05.2	24.3	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.1	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.0	28.5	05.5	28.4	05.7	28.4	06.0	28.2	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05.7	29.4	05.8	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.5	31.4	06.1	31.4	06.2	31.3	06.6	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.1	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.2	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.0	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.2	07.6	38.1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.7	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4	43
44	43.3	07.5	43.2	08.4	43.1	08.6	43.0	09.1	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	11.0	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.1	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.2	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Diff.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Diff.
	80 Deg.		79 Deg.		7 Point.		78 Deg.		77 Deg.		76 Deg.		

Dist.	10 Deg.		11 Deg.		1 Point.		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
51	50.2	08.8	50.1	09.7	50.0	10.0	50.0	10 6	49.7	11.5	49 5	12.3	51
52	51.2	09 0	51.0	09 9	51.0	10.1	50 9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11 2	52.6	12 1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11 4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54 5	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.8	55.9	11.1	55.8	11.8	55 5	12.8	55.3	13 8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56 3	14.0	58
59	58.1	10 2	57 9	11.3	57.9	11.5	57.7	12.3	57 5	13.3	57 2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58 7	12 5	58.5	13.5	58 2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11 8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15 2	63
64	63.0	11.1	62.8	12.2	62.8	12 5	62.6	13 3	62.3	14.4	62.1	15.5	64
65	64 0	11.3	63.8	12.4	63.7	12.7	63.6	13 5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64 6	13 7	64 3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13 9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66 5	14.1	66 2	15.3	66.0	16.4	68
69	68 0	12.0	67.7	13.2	67.7	13.5	67 5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13 4	68.7	13.7	68.5	14.5	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69 6	13.9	69.4	14.8	69.2	16.0	68 9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70 4	15.0	70.1	16.2	69.9	17.4	72
73	71 9	12.7	71 7	13.9	71.6	14.2	71 4	15.2	71.1	16.4	70.8	17 6	73
74	72.9	12 8	72.6	14 1	72.6	14.4	72.4	15 4	72 1	16.6	71.8	17.9	74
75	73 9	13.0	73.6	14 3	73.6	14.6	73.4	15.6	73 1	16 9	72.8	18.1	75
76	74.8	13.2	74.6	14 5	74.5	14.8	74.3	15.8	74 0	17.1	73.7	18.4	76
77	75 8	13 4	75.6	14.7	75.5	15.0	75.3	16.0	75 0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14 9	76.5	15.2	76.3	16 2	76 0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17 8	76.6	19.1	79
80	78.8	13 9	78.5	15.3	78.5	15.6	78.2	16.6	77 9	18.0	77.6	19.3	80
81	79 8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18 2	78.6	19.4	81
82	80 8	14.2	80.5	15.6	80.4	16 0	80.2	17.0	79 9	18 4	79.6	19 8	82
83	81.7	14.4	81.5	15.8	81.4	16 2	81.2	17.2	80.9	18.7	80.5	20 1	83
84	82 7	14.6	82.5	16 0	82.4	16.4	82.2	17.5	81 8	18.9	81.5	20 3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83 8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85 1	18.1	84.8	19 6	84.4	21.0	87
88	86.7	15 3	86 4	16.8	86.3	17 2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18 5	86.7	20.0	86.4	21.5	89
90	88.6	15 6	88.3	17.2	88.3	17.5	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.2	17.8	89.0	18.9	88.7	20.5	88,3	22 0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19 1	89.6	20.7	89.3	22.2	92
93	91.6	16.1	91.3	17 7	91.2	18 1	91 0	19.3	90.6	20.9	90 2	22 5	93
94	92.6	16.3	92.3	17 9	92 2	18.3	91.9	19 5	91.6	21.1	91.2	22.7	94
95	93.5	16.5	93.3	18 1	93 2	18 5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95 2	18 5	95.1	18.9	94.9	20, 2	94.5	21.8	94 1	23.5	97
98	96 5	17.0	96.2	18.7	96.1	19 1	95 9	20.4	95.5	22.0	95.1	23.7	98
99	97 5	17 2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23 9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.5	97.0	24 2	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		

Dist.	1 ¼ Poin		15 Deg.		16 Deg.		1 ½ Poin		17 Deg.		18 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	00.9	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00 5	01 9	00.6	01.9	00.6	01.9	00 6	2
3	02.9	00.7	02 9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.8	00 9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03 8	01.2	03.8	01.2	03 8	01.2	4
5	04.8	01.2	04 8	01.3	04.8	01 4	04 8	01.5	04 8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01 5	05.8	01.6	05.8	01.7	05.7	01.7	05.7	01.8	6
7	06.8	01.7	06.8	01.8	06.8	01.9	06.8	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07 7	02.1	07.7	02.2	07.7	02.3	07 6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08 6	02.5	08 6	02.6	08.6	02.6	08 6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02 8	09.6	02.9	09 6	02.9	09.5	03 1	10
11	10.7	02.8	10.6	02.8	10.6	03.0	10.5	03 2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11 6	03.1	11.5	03.3	11 5	03.5	11.5	03.5	11.4	03 7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04 1	13.3	04.3	14
15	14.5	03.6	14 5	03.9	14.4	04 1	14 4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	04 0	15.5	04.1	15.4	04.4	15.3	04 6	15.3	04.7	15.2	04.9	16
17	16.5	04 1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.2	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04 9	18.3	05.2	18.2	05.5	18.2	05 5	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19 1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05 4	20.2	05 8	20 1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.0	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07 1	23
24	23.3	05.8	23.2	06.2	23.1	06 6	23.0	06.8	22.9	07.0	22 8	07.4	24
25	24.2	06.0	24.1	06.5	24 0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	24.9	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07 0	25.9	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07 2	26.9	07.7	26 8	08.1	26.8	08.2	26.6	08.6	28
29	28.1	07.0	28.0	07 5	27.8	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29 0	07.8	28.8	08 3	28 7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08 5	29 7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.9	30.9	08.3	30.7	08.8	30.6	09.3	30 6	09.3	30.4	10.0	32
33	32.0	08.0	31.9	08 5	31.7	09.1	31.6	09 6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09 9	32 3	10.5	34
35	33.9	08.5	33.8	09.0	33 6	09 6	33.5	10.2	33 5	10.2	33.3	10.8	35
36	34.9	08.7	34 8	09.3	34.6	09 9	34.4	10 4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10 2	35.4	10 7	35 4	10.8	35.2	11.4	37
38	36.9	09 2	36 7	09 8	36.5	10 5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10 3	38.4	11.0	38.3	11 6	38 2	11.7	38.0	12.4	40
41	39.8	10 0	39.6	10 6	39 4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40 6	10.9	40.4	11.6	40.2	12.2	40 2	12 3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11 8	41.1	12 5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.5	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10 9	43.5	11.6	43.2	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.3	44 0	13.4	43.7	14.2	46
47	45.6	11 4	45.4	12.2	45.2	12.9	45.0	13 6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45 9	13.9	45.9	14.0	45.6	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46 9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14 6	47.5	15.4	50
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	6 ¾ Poin		75 Deg.		74 Deg.		6 ½ Poin		73 Deg.		72 Deg.		

Dist.	1 ¼ Poin		1.5 Deg.		16 Deg.		1 ½ Poin		17 Deg.		18 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.0	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	49.0	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17 0	55
56	54.3	13.6	54 1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55.3	13.8	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17 6	57
58	56.3	14.1	56.0	15.0	55.7	16 0	55.5	16.8	55 5	17.0	55.2	17 9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.2	56 1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17 4	57.4	17.5	57 1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.1	59 6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15 3	60.8	16.3	60.5	17 4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.5	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17 9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20 4	66
67	65.0	16.3	64.7	17.4	64.4	18.5	64.1	19.4	64 1	19 6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19 0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67 9	17.0	67.6	18.1	67.3	19.3	67 0	20.3	66 9	20.5	66.6	21.6	70
71	68.9	17.2	68.6	18.8	68.2	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.0	68 5	22.2	72
73	70 8	17.7	70.5	18.9	70.2	20.1	69.8	21 2	69.8	21.3	69.4	22.6	73
74	71.8	18 0	71 5	19.1	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22 9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21 8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.0	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74 0	21.2	73.7	22.3	73.6	22.5	73.2	23.8	77
78	75.7	18.9	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20 4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23 2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22 3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.3	80.2	21.5	79.8	22 9	79.4	24.1	79 4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.8	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82 4	20 7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84 4	21.1	84.0	22 5	83.6	24.0	83.3	25 2	83.2	25.4	82.7	26.9	87
88	85 4	21.4	85.0	22.8	84.6	24.2	84.2	25.5	84.1	25.7	83.7	27.2	88
89	86 3	21.6	86.0	23.0	85.6	24.5	85 2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86 9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.3	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89 4	29.0	94
95	92.1	23.1	91.8	24 6	91.3	26.2	90.9	27.6	90.8	27.8	90.3	29.3	95
96	93.1	23.3	92.7	24.8	92.3	26.4	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92,8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28 4	93,7	28.6	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28 7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95 7	29 0	95.6	29.2	95.1	30.9	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	6 ¾ Poin		75 Deg.		74 Deg.		6 ½ Poin		73 Deg.		72 Deg.		

Dist.	19 Deg. Lat.	19 Deg. Dep	1 ¾ Poin Lat.	1 ¾ Poin Dep	20 Deg. Lat.	20 Deg. Dep	21 Deg. Lat.	21 Deg. Dep	22 Deg. Lat.	22 Deg. Dep	2 Points Lat.	2 Points Dep	Dist.
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.6	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	01.9	05.6	02.0	05.6	02.0	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02 4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03 1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03 2	08.3	03 4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04 3	11.1	04.5	11.1	04.6	12
13	12.3	04 2	12.2	04.4	12.2	04.4	12.1	04.7	12.0	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14 0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.4	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.3	16.8	06.4	16.7	06.7	16.6	06.8	18
19	18.0	06.1	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.9	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.6	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.5	08.2	22.4	08.6	22.2	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09 0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.3	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.2	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.7	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10 4	30.1	10.8	30.1	10.9	29.1	11.5	29.7	12.0	29.6	12.2	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30 6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.4	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.1	34.8	12.5	34.8	12.6	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	45.1	14.5	38
39	36.9	12.6	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	36.9	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38 0	15.3	37.9	15.7	41
42	39.7	14.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14 5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	1675	43
44	41.6	14.3	41.4	14.8	41.3	15 0	41.1	15.8	40 8	16.5	40.6	16.8	44
45	42.6	14.6	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.8	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.6	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	15.9	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.3	45.3	18.7	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	71 Deg.		6 ¼ Poin		70 Deg.		69 Deg.		68 Deg.		6 Point.		

Dist.	19 Deg. Lat.	19 Deg. Dep	1¾ Poin Lat.	1¾ Poin Dep	20 Deg. Lat.	20 Deg. Dep	21 Deg. Lat.	21 Deg. Dep	22 Deg. Lat.	22 Deg. Dep	2 Points Lat.	2 Points Dep	Dist.
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.4	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.8	49 0	20.3	53
54	51.1	17.6	50.8	18.2	50.7	18.5	50.4	19.3	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.6	50.8	21.0	55
56	52.9	18.2	52.7	18.9	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52 8	21.3	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20 8	53.8	21.7	53.6	22.2	58
59	55.8	19.2	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22 6	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.5	55.4	23.0	60
61	57.7	19.9	57.4	20.5	57.3	20.9	56.9	21.9	56.5	22.8	56.3	23.3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22.2	57.5	23.2	57 3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20 8	60.3	21.6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60.7	23 3	60.3	24.3	60.0	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.6	61.2	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63.0	22.9	62.5	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.5	65.0	23.2	64.8	23.6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.3	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66.8	23.9	66.7	24.3	66.3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.2	67.7	24.6	67.2	25.8	66.7	27.0	66.5	27.6	72
73	69.0	23.8	68.7	24.6	68.6	25.0	68.1	26.2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69.5	25.3	69.1	26.5	68.6	27.7	68 4	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26.9	69.5	28.1	69.3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	70.9	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71.9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	27.9	72.3	29.2	72.1	29.8	78
79	74.7	25.7	74.4	26.6	74.2	27.0	73.7	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	26.9	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.7	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.5	29.4	76.0	30.7	75.8	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	76.9	31.1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.4	27.7	80.1	28.6	79.9	29.1	79.3	30.5	78.8	31.8	78 6	32.5	85
86	81.3	28.0	81 0	29.0	80.8	29 4	80.3	30.8	79 7	32.2	79.4	32 9	86
87	82 3	28.3	81.9	29 3	81.8	29.7	81.2	31.2	80.7	32.6	80.4	33.3	87
88	83.2	28 6	52.8	29.6	82.7	30.1	82.1	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30.0	83.6	30 4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.1	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	84.9	32 6	84.4	34.1	84.1	34.8	91
92	87.0	29.9	86.6	31.0	86.4	31.5	85.9	33.0	85.3	34.5	85.0	35.2	92
93	88.0	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	88.9	30.6	88.5	31.7	88.3	32.1	87.7	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.3	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	35.9	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33.2	90.5	34.8	89.9	36.3	89.6	37.1	97
98	92.7	31.9	92.3	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90.5	37.5	98
99	93.6	32.2	93.2	33.3	93.0	33.9	92.4	35 5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94.2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	71 Deg.		6¼ Poin		70 Deg.		69 Deg.		68 Deg.		6 Point.		

Diff.	23 Deg.		24 Deg.		25 Deg.		2 1/4 Poin		26 Deg.		27 Deg.		Diff.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.6	01.6	03.6	01.7	03.6	01.7	03.6	01.7	03.6	01.8	4
5	04.6	01.9	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.2	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.7	05.6	11.7	05.7	11.6	05.8	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	05.9	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.6	14.4	07.0	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.4	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.4	18.1	08.5	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.2	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.9	19.6	10.0	22
23	21.2	09.0	21.0	09.3	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.7	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.7	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.8	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.1	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.4	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.4	33.8	15.0	33.5	15.6	33.4	15.8	33.2	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.4	34.4	16.0	34.3	16.2	34.1	16.6	33.9	17.2	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.0	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.2	16.9	36.2	17.1	35.9	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.8	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.2	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.5	22.7	50
Diff.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Diff.
	67 Deg.		66 Deg.		65 Deg.		5 3/4 Poin		64 Deg.		63 Deg.		

Dist.	23 Deg.		24 Deg.		25 Deg.		2 1/4 Poin		26 Deg.		27 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
51	46.9	19.9	46.6	20.7	46.2	21.5	46.1	21.8	45.8	22.3	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.5	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.7	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.0	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.6	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	56.9	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.0	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.7	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.2	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.7	68.6	35.0	77
78	71.8	30.5	71.2	31.7	70.7	33.0	70.5	33.3	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.8	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.2	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.7	37.2	79.5	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.4	80.2	40.9	90
91	83.7	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.8	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.4	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.3	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.1	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.7	89.9	43.8	89.1	45.4	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	67 Deg.		66 Deg.		65 Deg.		5 3/4 Poin		64 Deg.		63 Deg.		

Dist.	28 Deg. Lat.	28 Deg. Dep	2 ½ Poin Lat.	2 ½ Poin Dep	29 Deg. Lat.	29 Deg. Dep	30 Deg. Lat.	30 Deg. Dep	2 ¾ Poin Lat.	2 ¾ Poin Dep	31 Deg. Lat.	31 Deg. Dep	Dist.
1	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02.6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03 5	01.9	03.5	01.9	03 5	01.9	03 5	02.0	03.4	02 1	03.4	02.1	4
5	04.4	02.3	04 4	02.4	04 4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05.2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.1	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09 6	05.3	09.5	05.5	09.4	05.6	09.4	05.7	11
12	10.6	05.6	10.6	05.6	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12.0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07 7	15
16	14.1	07.5	14.1	07.5	14.0	07.7	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.4	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09.2	15.4	09.3	18
19	16.8	08.9	16.8	08.9	16.6	09.2	16.4	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.3	10.0	17 1	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10.8	18.0	10.8	21
22	19.4	10.3	19.4	10.3	19.2	10.7	19.0	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20 1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.4	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21.6	12.5	21.4	12.8	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23 6	13.1	23.4	13.5	23.1	13.9	23.1	13.9	27
28	24 7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	59
30	26.5	14.1	26.5	14.1	26 2	14.5	26.0	15.0	25.7	15 4	25.7	15.4	30
31	27.4	14.5	27.3	14.6	27.1	15.0	26 8	15.5	26.6	15.9	26.6	16.0	31
32	28.2	15.0	28.2	15.1	28.0	15.5	27.7	16 0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.5	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29.7	16.5	29.5	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.4	30.9	16.5	30.6	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.4	31.2	18.0	30.9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17 9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17 0	33.5	17.9	33.2	18.4	32.9	19.0	32.5	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18 4	34.1	18.9	33.8	19.5	33.4	20 0	33.4	20.1	39
40	35.3	18.8	35.3	18.9	35.0	19.4	34.6	20.0	34.3	20.6	34.3	20.6	40
41	36.2	19.2	36.1	19.3	35.8	19.9	35 5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.1	37.9	20.3	37.6	20.8	37.2	2105	36.9	22.1	36.9	22.1	43
44	38.8	20 6	38.8	20.7	38 5	21.3	38.1	22.0	37.7	22.6	37.7	22.6	44
45	39.7	21.1	39.7	21.2	39.3	21.8	39.0	22.5	38.6	23.1	38.6	23.2	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23 6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.0	43.2	23.2	42.8	23.7	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	23.6	43.7	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	62 Deg.		5 ½ Poin		61 Deg.		60 Deg.		5 ¼ Poin		59 Deg.		

Dist.	28 Deg. Lat.	28 Deg. Dep	2 ½ Poin Lat.	2 ½ Poin Dep	29 Deg. Lat.	29 Deg. Dep	30 Deg. Lat.	30 Deg. Dep	2 ¾ Poin Lat.	2 ¾ Poin Dep	31 Deg. Lat.	31 Deg. Dep	Dist.
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44 6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.3	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.3	47.6	25.5	47.2	26.2	46.8	27 0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26 4	49.0	27.1	48.5	28.0	48.0	28.8	48 0	28.8	56
57	50.3	26.8	50.3	26.9	49.8	27.6	49.4	28.5	48.9	29 3	48.9	29.4	57
58	51.2	27 2	51.2	27.3	50.7	28.1	50.2	29 0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30 3	50.6	30.4	59
60	53.0	28 2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.7	53.3	29.6	52.8	30 5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31 9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.5	56.8	31 5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58 2	31.1	57.7	32 0	57.2	33.0	56.6	33.9	56 6	34.0	66
67	59.2	31.4	59.1	31.6	58.6	32.5	58.0	33 5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60 0	32.0	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.8	32.5	60.3	33.4	59.7	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34 4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.3	36.0	61.8	37.0	61.7	37.1	72
73	64.4	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.1	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64 3	38.6	64.3	38.6	75
76	67.1	35.7	67 0	35.8	66.5	36.8	65.8	38 0	65.2	39.1	65.1	39.1	76
77	68 0	36.1	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37 2	69.1	38.3	68.4	39.5	67.8	40.6	67 7	40.7	79
80	70.6	37.6	70.5	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	28.0	71.4	38.2	70.8	39.3	70.1	40 5	69 5	41 6	69.4	41.7	81
82	72.4	38.5	72.3	38.6	71.7	39.7	70 9	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73 2	39.1	72.6	40.2	71.9	41.5	71.2	42 7	71.1	42.7	83
84	74.2	39 4	74.1	39.6	73.5	40.7	72.7	42.0	72.1	43.2	72.0	43.3	84
85	75.0	39 9	75 0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43 8	85
86	75.9	40.4	75.8	40 5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	41.9	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.2	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.2	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43 4	80 5	44.6	79.7	46.0	78 9	47.3	78.9	47.4	92
93	82.1	43.6	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47 9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	63.8	44.6	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.2	84.0	46.5	83.1	48.0	82.3	49.3	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	62 Deg.		5 ½ Poin		61 Deg.		60 Deg.		5 ¼ Poin		59 Deg.		

Diff.	32 Deg.		33 Deg.		3 Point.		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	00 8	00.5	00.8	00.5	00.8	00.6	00 8	00.6	00.8	00.6	00.8	00.6	1
2	01 7	01.1	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.2	2
3	02 5	01.6	02.5	01 6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03 4	02 1	03.4	02.2	03 3	02.2	03 3	02.2	03.3	02 3	03.2	02 3	4
5	04.2	02.6	04 2	02.7	04 2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.4	04.9	03.4	04.8	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06 8	04.2	06 7	04.4	06 6	04.4	06.6	04.5	06.5	04.6	06.5	04.7	8
9	07 6	04.8	07 5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05 4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09 1	06.1	09.1	06.1	09 0	06.3	08.9	06.5	11
12	10.2	06 4	10.1	06.5	10.0	06.7	09.9	06 7	09.8	06.9	09.7	07.0	12
13	11.0	06 9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11 9	07.4	11.7	07.6	11 6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08 3	12.4	08.4	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13 4	08.7	13 3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09 0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.7	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	15.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15 9	10.3	15.8	10.6	15.7	10.6	15 6	10.9	15.4	11.2	19
20	17.0	10.6	16 8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.6	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12 5	19.1	12.8	19.0	12.8	18.8	13.2	18.6	13.5	23
24	20.3	12 7	20.1	13.1	20 0	13 3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.7	13.9	20.7	14.0	20.5	14.3	20.1	14 7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.5	14.5	21 3	14.9	21.0	15 3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23 7	14 8	23.5	15.2	23 3	15.5	23.2	15.6	22.9	16.1	22.6	16.5	28
29	24 6	15.4	24.3	15.8	24.1	16.1	24.0	16 2	23.8	16.6	23.5	17 0	59
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24 6	17.2	24.3	17 6	30
31	26 3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26 6	17 8	26 5	17.9	26.2	18.3	25.9	18.8	32
33	28.0	17 5	27.7	18 0	27.4	18.3	27.4	18.4	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19 1	29 1	19 4	29.0	19.6	28.7	20 1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20 1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21 1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20 7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22 3	31 5	22.9	39
40	33.9	21 2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34 1	22.8	34 0	22 9	33.6	23 5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.7	23.9	35 6	24.0	35.2	24.6	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.1	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36 4	26.4	45
46	39.0	24.4	38.6	25.0	38.2	25.5	38.1	25 7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38 5	26.9	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.5	26.0	41.1	26.7	40.7	27.2	40 6	27.4	40 1	28 1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27 8	41.4	28.0	41.0	28 7	40.4	29.4	50
Diff.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Diff.
	58 Deg.		57 Deg.		5 Points		56 Deg.		55 Deg.		54 Deg.		

Dist.	32 Deg. Lat.	32 Deg. Dep	33 Deg. Lat.	33 Deg. Dep	3 Point. Lat.	3 Point. Dep	34 Deg. Lat.	34 Deg. Dep	35 Deg. Lat.	35 Deg. Dep	36 Deg. Lat.	36 Deg. Dep	Dist.
51	43·2	27·0	42.8	27.8	42.4	28.3	42.3	28.5	41·8	29·2	41·3	30.0	51
52	44·1	27.6	43.6	28·3	43·2	28.9	43·1	29·1	42.6	29.8	42·1	30.6	52
53	44.9	28.1	44.5	28.9	44.1	29·4	43 9	29.6	43.4	30.4	42·9	31·2	53
54	45·8	28.6	45·3	29·4	44·9	30 0	44.5	30 2	44.2	31.0	43·7	31.7	54
55	46.6	29·1	46.1	30 0	45 7	30.6	45·6	30.7	45·1	31·5	44·5	32·3	55
56	47 5	29 7	47·0	30.5	46.6	31 1	46·4	31.3	45·9	32·1	45·3	32 9	56
57	48·3	30.2	47.8	31.0	47·4	31·7	47·3	31·9	46·7	32.7	46·1	33·5	57
58	49 2	30.7	48·7	31·6	48 2	32 2	48.1	32.4	47·5	33·3	46.9	34·1	58
59	50 0	31·3	49·5	32·1	48·0	32.8	48·9	33.0	48·3	33·8	47.7	34 7	59
60	50.9	31·8	50·3	32·7	49·9	33·3	49.7	33·5	49·1	34·4	48·5	35·3	60
61	51·7	32·3	51.2	33·2	50 7	33·9	50.6	34 1	50.0	34.9	49·3	35.9	61
62	52.6	32.9	52.0	33.8	51.5	34·4	51·4	34 7	50.8	35.6	50.2	36.4	62
63	53·4	33·4	52·9	34·3	52·4	35·0	52.2	35.2	51.6	36.1	51·0	37.0	63
64	54·3	33 9	53·7	34·9	53·2	35·5	53·1	35·8	52·4	36·7	51.8	37.6	64
65	55·1	34·4	54·5	35·4	54 0	36.1	53.9	36·3	53·2	37·3	52·6	38·2	65
66	56.0	35·0	55 3	35 9	54·9	36·7	54·7	36.9	54·1	37·9	53·4	38.8	66
67	56·8	35·5	56·2	36·5	55·7	37·2	55·5	37.5	54·9	38 4	54·2	39·4	67
68	57.7	36.0	57.0	37 0	56·5	37·8	56.4	38.0	55·7	39·0	55 0	40·0	68
69	58·5	36.6	57·9	37.6	57.4	38 3	57·2	38.6	56·5	39 6	55·8	40.6	69
70	59 4	37·1	58·7	38.1	58·2	38·9	58·0	39 1	57·3	40·1	56.6	41·1	70
71	60.2	37.6	59·6	38·7	59 0	39·4	58.9	39 7	58·2	40.7	57·4	41.7	71
72	61.0	38 1	60.4	39·2	59·8	40·0	59.7	40.3	59·0	41.3	58 2	42·3	72
73	61·9	38.7	61.2	39.8	60 7	40·6	60.5	40 8	59·8	41 9	59·1	42.9	73
74	62·7	39.2	62·1	40.3	61.5	41·1	61.3	41.4	60 6	42·4	59 9	43·5	74
75	63.6	39.7	62.9	40·8	62·4	41·7	62.2	41.9	61·4	43 0	60.7	44·1	75
76	64·4	40 3	63·8	41·5	63.2	42.2	63·0	42 5	62.3	43·6	61·5	44 7	76
77	65·3	40·8	64 6	41.9	64.0	42·8	63.8	43·0	63·1	44.2	62·3	45·3	77
78	66·1	41 3	65·4	42.5	64·8	43·3	64·7	43.6	63·9	44 7	63.1	45·8	78
79	67 0	41·9	66 3	43·0	65.7	43·9	65·5	44·2	64·7	45·3	63.9	46·4	79
80	67.8	42.4	67 1	43 6	66·5	44 4	66·3	44.7	65·5	45·9	64.7	47.0	80
81	68.7	42·9	68·0	44·1	67·3	45·0	67·1	45·3	66.4	46.5	65 5	47·6	81
82	69·5	43·4	68.8	44.7	68.2	45·5	68·0	45.8	67 2	47 0	66·3	48·2	82
83	70.4	44.0	69 6	45 2	69.0	46·1	68.8	46.4	68.0	47·6	67.1	48 8	83
84	71.2	44.5	70·5	45·8	69.8	46.7	69.6	47.0	68·8	48.2	68·0	49 4	84
85	72.1	45.0	71·3	46·3	70·7	47·2	70·5	47·5	69.6	48.8	68.8	50.0	85
86	72.9	45.6	72.1	46.8	71·5	47·8	71·3	48.1	70·5	49·3	69.6	50·5	86
87	73.8	46·1	73.0	47·3	72 3	48.3	72.1	48.6	71·3	49·9	70.4	51.1	87
88	74·6	46 6	73.8	47·9	73.2	48·9	72.9	49·2	72·1	50·5	71·2	51·7	88
89	75·5	47·2	74·7	48·5	74·0	49 4	73·8	49.8	72 9	51·0	72.0	52.3	89
90	76·3	47 7	75·5	49·0	74·8	50.0	74.6	50·3	73 7	51.6	72.8	52 9	90
91	77·2	48.2	76.3	49.6	75.7	50 6	75·4	50.9	74 5	52.2	73·6	53·5	91
92	78.0	48·7	77·2	50.1	76·5	51.1	76·3	51·4	75·4	52.8	74·4	54·1	92
93	78·9	49.3	78 0	50 6	77·3	51·7	77.1	52.0	76.2	53·3	75·2	54.7	93
94	79·7	46·8	78·9	51·2	78.2	52.2	77·9	52.6	77·0	53 9	76.0	55.2	94
95	80.6	50.3	79·7	51.7	79·0	52·8	78 8	53.1	77.8	54·5	76.9	55.8	95
96	81·4	50.9	80 5	52·3	79.8	53·3	79.6	53.7	78.6	55.1	77.7	56.4	96
97	82·3	51·4	81·4	52.8	80.6	53·9	80·4	54·2	79·5	55·6	78.5	57.0	97
98	83.1	51·9	82.2	53·4	81·5	54·4	81·2	54·8	80·3	56.2	79·3	57 6	98
99	84·0	52.5	83·1	53 9	82.3	55 0	82·1	55.4	81·1	56.8	80.1	58·2	99
100	84.8	53·0	83·9	54·5	83·1	55.6	82.9	55·9	81.9	57 4	80.9	58.8	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	58 Deg.		57 Deg.		5 Point.		56 Deg.		55 Deg.		54 Deg.		

Dist.	3 ¼ Poin		37 Deg.		38 Deg.		39 Deg.		3 ½ Poin		40 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.7	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.5	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.1	02.5	03.5	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.6	03.9	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.4	07.4	09.3	07.5	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.6	09.4	11.6	09.5	11.5	09.6	15
16	12.8	09.5	12.8	09.6	12.6	09.8	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.6	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	13.9	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.0	14.5	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.8	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.5	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.4	22.8	17.8	22.1	18.3	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.0	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.6	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.2	27.1	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	27.9	21.1	27.6	21.5	27.2	22.0	27.0	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	27.7	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	29.0	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.5	28.6	38.3	28.9	37.8	29.5	37.8	30.2	37.1	30.4	36.8	30.9	48
49	39.3	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	4 ¾ Poin		53 Deg.		52 Deg.		51 Deg.		4 ½ Poin		50 Deg.		

Dist.	3 ¼ Poin		37 Deg.		38 Deg.		39 Deg.		3 ½ Poin		40 Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
51	41·0	30·4	40·7	30·7	40·2	31·4	39·6	32·1	39·4	32·3	39·1	32·8	51
52	41·8	31·0	41·5	31·3	41·0	32·0	40·4	32·7	40·2	33·0	39·8	33·4	52
53	42·6	31·6	42·3	31·9	41·8	32·6	41·2	33·3	41·0	33·6	40·6	34·1	53
54	43·4	32·2	43·1	32·5	42·5	33·2	42·0	34·0	41·7	34·3	41·4	34·7	54
55	44·2	32·8	43·9	33·1	43·3	33·9	42·7	34·6	42·5	34·9	42·1	35·4	55
56	45·0	33·3	44·7	33·8	44·1	34·5	43·5	35·2	43·3	35·5	42·9	36·0	56
57	45·8	33·9	45·5	34·3	44·9	35·1	44·3	35·9	44·1	36·2	43·7	36·6	57
58	46·6	34·5	46·3	34·9	45·7	35·8	45·1	36·5	44·8	36·8	44·4	37·3	58
59	47·4	35·1	47·1	35·5	46·5	36·3	45·8	37·1	45·6	37·4	45·2	37·9	59
60	48·2	35·7	47·9	36·1	47·3	36·9	46·6	37·8	46·4	38·1	46·0	38·6	60
61	49·0	36·3	48·7	36·7	48·1	37·5	47·4	38·4	47·1	38·7	46·7	39·2	61
62	49·8	36·9	49·5	37·3	48·9	38·2	48·2	39·0	47·9	39·3	47·5	39·9	62
63	50·6	37·5	50·3	37·9	49·6	38·8	49·0	39·6	48·7	40·0	48·3	40·5	63
64	51·4	38·1	51·1	38·5	50·4	39·4	49·7	40·3	49·5	40·6	49·0	41·2	64
65	52·2	38·7	51·9	39·1	51·2	40·0	50·5	40·9	50·2	41·2	49·8	41·8	65
66	53·0	39·3	52·7	39·7	52·0	40·6	51·3	41·5	51·0	41·9	50·5	42·4	66
67	53·8	39·9	53·5	40·3	52·8	41·2	52·1	42·2	51·8	42 5	51·3	43·1	67
68	54·6	40·5	54·3	40·9	53·6	41·9	52·8	42.8	52·6	43·1	52·1	43·7	68
69	55·4	41·1	55·1	41·5	54·4	42·5	53·6	43·4	53·3	43·8	52·9	44·4	69
70	56·2	41·7	55·9	42·1	55·2	43·1	54·4	44·0	54·1	44·4	53·6	45·6	70
71	57·0	42·3	56·7	42.7	55·9	43·7	55·2	44·7	54·9	45·0	54·4	45·6	71
72	57·8	42·9	57·5	43·3	56·7	44·3	55·9	45·3	55·7	45·7	55·1	46·3	72
73	58·6	43·5	58·3	43·9	57·5	44·9	56·7	45·9	56·4	46·3	55·9	46·9	73
74	59·4	44·1	59·1	44·5	58·3	45·6	57·5	46·6	57·2	46·9	56·7	47·6	74
75	60·2	44·7	59·9	45·1	59·2	46·2	58·3	47·2	58·0	47·6	57·4	48·2	75
76	61·0	45·3	60·7	45·7	60·0	46·8	59·1	47·8	58·7	48·2	58·2	48·9	76
77	61·8	45·9	61·5	46·3	60·7	47·4	59·8	48·5	59·5	48·8	59·0	49·5	77
78	62·7	46·5	62·3	46·9	61·5	48·0	60·6	49·1	60·3	49·5	59·7	50·1	78
79	63·5	47·1	63·1	47·5	62·2	48·6	61·4	49·7	61·1	50·1	60 5	50·8	79
80	64·3	47·7	63·9	48·1	63·0	49·3	62·2	50 3	61·8	50·7	61·3	51·4	80
81	65·1	48·3	64·7	48·7	63·8	49·9	62·9	51·0	62·6	51·4	62·0	52·1	81
82	65·9	48·8	65·5	49·3	64·6	50·5	63·7	51·6	63·4	52·0	62·8	52·7	82
83	66·7	49·4	66·3	49·9	65·4	51·1	64·5	52·2	64·2	52·6	63·6	53·4	83
84	67·5	50·0	67·1	50·5	66·2	51·7	65·3	52·9	64·9	53·3	64·3	54·0	84
85	68·3	50·6	67·9	51·1	67·0	52·3	66·1	53·5	65·7	53·9	65·1	54·6	85
86	69·1	51·2	68·7	51·7	67·8	52·9	66·8	54·1	66·5	54·6	65·9	55·3	86
87	69·9	51·8	69·5	52·4	68·6	53·6	67·6	54·8	67·2	55·2	66·6	55·9	87
88	70·7	52·4	70·3	53·0	69·3	54·2	68·4	55·4	68·0	55·8	67·4	56·6	88
89	71·5	53·0	71·1	53·6	70·1	54·8	69·2	56·0	68·8	56·5	68·2	57·2	89
90	72·3	53·6	71·9	54·2	70·9	55·4	69·9	56·6	69·6	57·1	68 9	57·4	90
91	73·1	54·2	72·7	54·8	71·7	56·0	70·7	57·3	70·3	57·7	69·7	58·5	91
92	73·9	54·8	73·5	55·4	72·5	56·6	71·5	57·9	71·1	58·4	70·5	59·1	92
93	74·7	55·4	74·3	56·0	73·3	57·3	72·3	58·5	71·9	59·0	71·2	59·8	93
94	75·5	56·0	75·1	56·6	74·1	57·9	73·0	59·2	72·7	59·6	72·0	60·4	94
95	76·3	56·6	75·9	57·2	74·9	58·5	73·8	59·8	73·4	60·3	72·8	61·1	95
96	77·1	57·2	76·7	57·8	75·6	59·1	74·6	60·4	74·2	60·9	73·5	61·7	96
97	77·9	57·8	77·5	58·4	76·4	59·7	75·4	61·0	75·0	61·5	74·3	62·1	97
98	78·7	58·4	78·3	59·0	77·2	60·3	76·2	61·7	75·7	62·2	75·2	63·0	98
99	79·5	59·0	79·1	59·6	78·0	60·9	76·9	62·3	76·5	62·8	75·8	63·6	99
100	80·3	59·6	79·9	60·2	78·8	61·6	77·7	62·9	77·3	63·4	76·6	64·3	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	4 ¾ Poin		53 Deg.		52 Deg.		51 Deg.		4 ½ Poin		50 Deg.		

Diff.	41 Deg.		42 Deg.		3 ¼ Poin		43 Deg.		44 Deg.		4 Point.		Diff.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	02.9	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.6	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.3	05.9	05.4	05.8	05.5	05.7	05.6	05.7	05.7	8
9	06.8	05.9	06.7	06.0	06.7	06.0	06.6	06.1	06.5	06.2	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.1	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.1	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.5	15.5	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.5	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.4	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.4	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.1	20.9	20.8	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.6	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.6	24.5	22.1	24.4	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.6	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.7	24.1	26.7	24.2	26.3	24.5	25.9	25.0	25.4	25.4	36
37	27.9	24.3	27.5	24.7	27.4	24.8	27.0	25.2	26.6	25.7	26.1	26.1	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.0	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.2	27.3	28.8	27.8	28.3	28.3	40
41	31.0	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.5	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	31.9	28.8	31.9	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	30.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.3	31.5	35.7	31.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.0	33.6	36.5	34.1	36.0	34.7	35.3	35.3	50
Diff.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Diff.
	49 Deg.		48 Deg.		4 ¼ Poin		47 Deg.		46 Deg.		4 Point.		

Dist.	41 Deg. Lat.	41 Deg. Dep	42 Deg. Lat.	42 Deg. Dep	3 ¼ Poin Lat.	3 ¼ Poin Dep	43 Deg. Lat.	43 Deg. Dep	44 Deg. Lat.	44 Deg. Dep	4 Point. Lat.	4 Point. Dep	Dist.
51	38 5	33·5	37·9	34·1	37·8	34·2	37·3	34.8	36 7	35·4	36·1	36·1	51
52	39 2	34·1	38.6	34·8	38.5	34·9	38.0	35.5	37·4	36.1	36.8	36.8	52
53	40·0	34·8	39·4	35·5	39·3	35·6	38.8	36.1	38.1	36 8	37·5	37 5	53
54	40 8	35·4	40.1	36·1	40.0	36.3	39.5	36.8	38.8	37·5	38.2	38 2	54
55	41·5	36 0	40·9	36 8	40.7	36.9	40·2	37·5	39·6	38.2	38·9	38·9	55
56	42 3	36·7	41·6	37·5	41·5	37·6	41·0	38.2	40.3	38.9	39·6	39·6	56
57	43·0	37·4	42.4	38 1	42·2	38.3	41·7	38.9	41 0	39.6	40·3	40·3	57
58	43·8	38.1	43.1	38·8	43·0	38·9	42.4	39·5	41·7	40.3	41 0	41·0	58
59	44·5	38·7	43·8	39·5	43·7	39·6	43·1	40.2	42.4	41·0	41·7	41·7	59
60	45 3	39·4	44·6	40·1	44 5	40.3	43·8	40.9	43·2	41·7	42·4	42.4	60
61	46.0	40.0	45·3	40.8	45.2	41·0	44·6	41·7	43 9	42·4	43·1	43·1	61
62	46·8	40.7	46.1	41.5	45·9	41·6	45 3	42 3	44 6	43·1	43·8	43·8	62
63	47·6	41 3	46 8	42.2	46.7	42·3	46.1	43 0	45 3	43.8	44·5	44·5	63
64	48·3	42.0	47·5	42.8	47.4	43·0	46·8	43·6	46 0	44·5	45·3	45·3	64
65	49.1	42.6	48·3	43·5	48.2	43·6	47·5	44 3	46.8	45·1	46.0	46.0	65
66	49·8	43·3	49·0	44·2	48·9	44·3	48 3	45.0	47·5	45·8	46.7	46·7	66
67	50.6	44·0	49.8	44·8	49 6	45·0	49·0	45.7	48·2	46·5	47.4	47·4	67
68	51.3	44.6	50·5	45·5	50.4	45·7	49·7	46.4	48.9	47.2	48.1	48·1	68
69	52.1	45 3	51.3	46·2	51·1	46.3	50 5	47 1	49.6	47 9	48.8	48.8	69
70	52.8	45·9	52.0	46 8	51.9	47 0	51·2	47 7	50.3	48.6	49·5	49 5	70
71	53.6	46·6	52.8	47·5	52.6	47·7	51.9	48.4	51·1	49·3	50·2	50.2	71
72	54·3	47·2	53 5	48.2	53·3	48·3	52·7	49·1	51·8	50 0	50.9	50.9	72
73	55·1	47 9	54·2	48 8	54·1	49 0	53.4	49·8	52·5	50.7	51.6	51.6	73
74	55·9	48·5	55 0	49·5	54·8	49·7	54·1	50 5	53·2	51.4	52·3	52·3	74
75	56.6	49·2	55·7	50.2	55.6	50.4	54.8	51.1	53·9	52 1	53·0	53·0	75
76	57·4	49·9	56·5	50.9	56.3	51.0	55.6	51·8	54·7	52.8	53 7	53·7	76
77	58·1	50.5	57·2	51·5	57·1	51·7	56·3	52·5	55.4	53·5	54·4	54·4	77
78	58·9	51.2	58.0	52 1	57·8	52·4	57 0	53·2	56.1	54·2	55·2	55·2	78
79	59.6	51.8	58·7	52·8.	58.5	53·0	57·8	53 9	56.8	54·9	55·9	55·9	79
80	60 4	52·5	59·4	53·5	59 3	53·7	58 5	54·6	57·5	55·6	56 6	56 6	80
81	61·1	53 1	60.2	54·2	60.0	54·4	59·2	55.2	58.3	56·3	57 3	57·3	81
82	61.9	53.8	60·9	54·9	60·8	55·1	60·0	55·9	59.0	57·0	58 0	58 0	82
83	62.6	54 5	61·7	55·5	61·5	55·7	60.7	56.6	59.7	57.6	58.7	58·7	83
84	63.4	55.1	62.4	56 2	62.2	56 4	61.4	57·3	60.4	58.3	59·4	59·4	84
85	64 2	55·9	63.2	56 9	63.0	57.1	62.2	58 0	61·1	59 0	60.1	60 1	85
86	64·9	56.4	63·9	57·5	63 7	57·7	63.0	58 6	61.9	59.7	60.8	60.8	86
87	65.7	57·1	64·7	58·2	64.5	58 4	63·6	59 3	62.6	60.4	61·5	61·5	87
88	66.4	57.7	65.4	58·9	65.2	59.1	64 4	60 0	63·3	61·1	62·2	62·2	88
89	67.2	58·4	66·1	59 6	65·9	59·8	65·1	60·7	64·0	61·8	62·9	62·9	89
90	67·9	59·0	66 9	60.2	66·7	60·4	65·8	61 4	64·7	62·5	63·6	63·6	90
91	68·7	59·7	67 6	60 9	67.4	61·1	66·5	62·1	65·5	63·2	64·3	64·3	91
92	69.4	60 4	68·4	61·6	68·2	61·8	67 3	62·7	66·2	63·9	65·0	65·0	92
93	70·2	61·0	69·1	62·2	68.9	62·4	68·0	63·4	66·9	64·6	65·8	65 8	93
94	71 0	61·7	69·9	62.9	69·6	63·1	68·7	64·1	67·6	65 3	66·5	66·5	94
95	71·7	62·3	70·6	63·6	70·4	63·8	69·5	64 8	68·3	66·0	67·2	67·2	95
96	72·5	63·0	71 3	64·2	71·1	64·5	70·2	65·5	69·1	66·7	67·9	67 9	96
97	73·2	63 6	72·1	64 9	71·9	65 1	70 9	66·1	69·8	67 4	68 6	68·6	97
98	74·0	64·3	72·5	65·6	72.6	65·8	71·7	66 8	70.5	68·1	69·3	69·3	98
99	74 7	65·0	73·6	66·2	73·4	66·5	72.4	67·5	71·2	68·8	70·0	70·0	99
100	75·5	65·6	74·3	66·9	74 1	67·2	73·1	68·2	71·9	69·5	70·7	70·7	100
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	49 Deg.		48 Deg.		4 ¼ Poin		47 Deg.		46 Deg.		4 Point.		

The Uſe and Explanation of the Table of Difference of Latitude and Departure.

THis is a Table larger and better contrived than any of this Nature yet extant, giving the Difference of Latitude and Departure, to any diſtance not exceeding 100, in Minutes and Tenth-Parts, to every Degree and Quarter Point of the Compaſs; and may be uſed to a greater diſtance, being taken out at twice or thrice according to the quantity of the diſtance, as ſhall be ſhown in the Uſe.

The Courſe ſtands at the head and foot of the Table, to every Degree and Quarter Point of the Compaſs; at the head it begins at 1 deg. ſo 2 deg. $\frac{1}{4}$ Point, *&c.* increaſing to 45 deg. or 4 Points. At the foot it begins at 45 Deg. or 4 Points, ſo 46 Deg. 47 Deg. 4 $\frac{1}{4}$ Points, *&c.* increaſing backwards to 90 Deg. or 8 Points. The Diſtance ſtands in the two outmoſt Columns, under the Title *Diſtance*, which on the left-hand Page begins at 1, and runs to 50; on the right-hand Page it begins at 51, and runs to 100. The Difference of Latitude and Departure ſtands under the Courſe at the head, and over it at the foot of the Table.

The Uſe of the Table.

This Table is very uſeful in Navigation, eſpecially in working a *Traverſe*.

Example 1.

The Courſe and Diſtance given, to find the Difference of Latitude and Departure by the Table.

Suppoſe a Ship ſail N. N. E. $\frac{1}{4}$ Eaſt, 95 min. and the Difference of Latitude and Departure required.

On the right-hand Page (becauſe the Diſtance is above 50) and at the top (becauſe it is under 4 Points) look for 2 $\frac{1}{4}$ Points, which is the Courſe; under which, and againſt 95 the diſtance, under the Title *Lat.* ſtands 81.5. which is 81 min. the $\frac{5}{10}$ the Difference of Latitude; and under the Title *Dep.* ſtands 48.8 that is, 48 min. $\frac{8}{10}$ which is the Departure required.

Example 2.

Suppoſe a Ship ſail Sourh 56°, Weſterly 48 min. the Difference of Latitude and Departure required.

On

On the left-hand Page, (becauſe the Diſtance is leſs than 50) and at the bottom (becauſe it is above 45 deg.) look for 56 deg. the Courſe; over which, and againſt 48 the diſtance, over the Title *Lat.* ſtands 26.8. that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* ſtands 39.8. that is, 39. min. $\frac{8}{10}$ the Departure required.

Example 3.

Suppoſe a Ship ſail North-Weſt by North 160 min. and the Difference of Latitude and Departure required by the Table.

On the right-hand Page at the top, look for 3 Points, the Courſe. Now becauſe the Table goes but to 100, take for 100 firſt; therefore under 3 Points, and againſt 100, under the Title *Lat.* ſtands 83.1. that is, 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* ſtands 55.6. that is, 55 min. $\frac{6}{10}$ the Departure; then for 90, under 3 Points, and againſt 60, under the Title *Lat.* ſtands 49.9. that is, 49 min. $\frac{9}{10}$ the Difference of Latitude; and under the Title *Dep.* ſtands 33.3. that is, 33 min. $\frac{3}{10}$ the Departure; then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, and the Sum is 133 the Difference of Latitude, and 88 $\frac{9}{10}$ the Departure required.

This Table is alſo uſeful in the reſolution of the reſt of the Problems of *Plain Sailing*, which for brevity ſake are omitted; but the general uſe of it is in the exact working of a Traverſe.

Example 1.

Suppoſe a Ship bound to a certain Port ſails S. E. by South, 49 min. the E. S. E. $\frac{1}{2}$ Eaſt. 52 min. then Eaſt by North $\frac{1}{2}$ Eaſt, 62 min. then S. S. W. $\frac{1}{2}$ Weſt, 57 min. then South $\frac{1}{2}$ Eaſt 39 min. to find the Difference of Latitude and Departure that the Ship hath made.

Set down the Several Courſes and Diſtances; firſt allowing for Lee-way, if any; then proceed to look out the Difference of Latitude and Departure from each Courſe and Diſtance (by the directions before given) in the Table, placing them in their proper Columns, (*viz.*) If the Courſe be Northerly, the Difference of Latitude muſt be put in the North Column; if Southerly, in the South Column; if it be Eaſterly, the Departure muſt be put in the Eaſt Coluuin; if Weſterly, in the Weſt Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and ſubtract the leſſer Difference of Latitude and Departure from the greater, and the Remainder is the whole Difference of Latitude and Departure the Ship hath made.

The

The Table.

Courses.	Distance.	Diff. Lat. North.	Diff. Lat. South.	Departure. East.	Departure. West.
S. E. by S.	49		40. 7	27. 2	
E.S.E. ½ E.	52		15 1.	49. 7	
E. by N. ½ E.	62	06. 1		61. 7	
S.S.W. ½ W.	57		50. 3		26.9
S. ½ E.	39		38. 8	03. 8	
		06. 1	144.9	142.5	26.9
			6.1	26.9	
			138.8	115.6	

The whole Difference of Latitude is 138 $\frac{8}{10}$ South, the Departure 115 $\frac{6}{10}$ East.

Example 2.

The Courses being given in Degrees, which often happens by reason of allowance for the Variation of the Compass, and in the like Cases.

Suppose a Ship bound to a certain Port, sails North 34°, West 65′, then North 67°, West 56′, then South 78°, West 48′, then North 23°, East 54′, then North 6°, East 36′, and the Difference of Latitude and Departure required.

The Table.

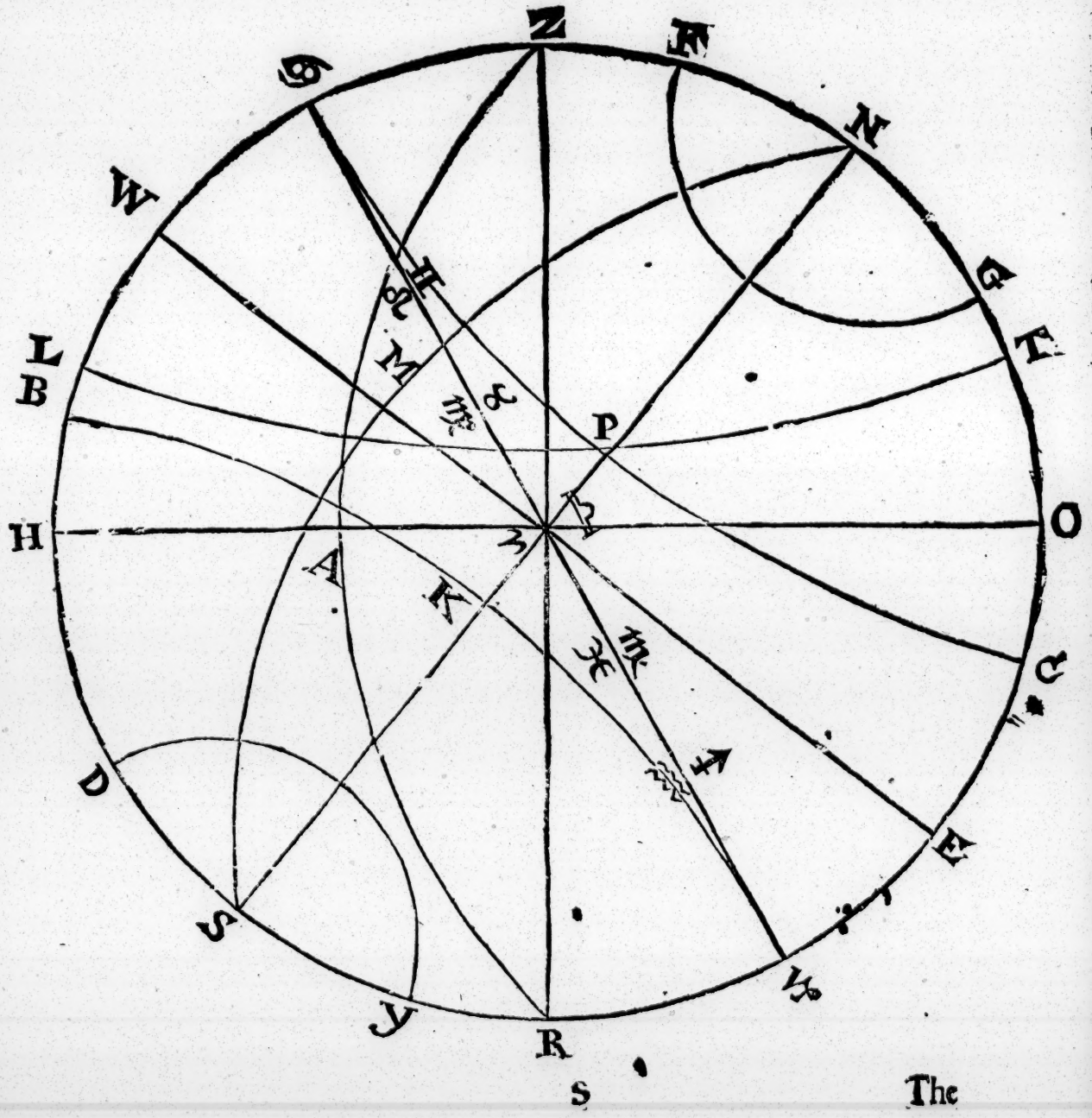
Courses.	Distance.	Diff. Lat. North.	Diff. Lat. South	Departure. East.	Departure. West.
N. W. 34°	65	53. 9			36.3
N. W. 67°	56	21. 9			51.5
S. W. 78°	48		10.0		47.0
N. E. 23°	54	49. 7		21. 1	
N. E. 06°	36	35. 8		03. 8	
		161.3	10.0	24.9	134.8
		10.0			24.9
		151.3			109.9

The whole Difference of Latitude is 151 $\frac{3}{10}$ North, the Departure 109 $\frac{9}{10}$ West.

Some

Some necessary Astronomical Definitions.

THE Poles of the World are two fixed Points in the Heavens, opposite one to the other; the one visible to us, called the *North-Pole*, marked with the Letter N; the other not visible to us, called the *South-Pole*, marked with S.



The

The *Axis* of the World is a Line imagined to pass from Pole to Pole, about which is performed the Diurnal Revolution.

The *Equinoctial* is a great Circle 90 deg. distant from the Poles of the World, and divides it into the North and South Hemispheres, it is noted by the Letters E. W.

The *Ecliptick* is a great Circle intersecting the Equinoctial in two opposite Points, the beginning of *Aries* and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 30 min. It is divided into twelve Signs, each containing 30 deg. Which are as follows:

Aries	♈	Are Northern Signs.	*Libra*	♎	Are Southern Signs.
Taurus	♉		*Scorpio*	♏	
Gemini	♊		*Sagittarius*	♐	
Cancer	♋		*Capricornus*	♑	
Leo	♌		*Aquarius*	♒	
Virgo	♍		*Pisces*	♓	

The *Ecliptick* is noted by the Characters of the twelve Signs.

The Poles of the *Ecliptick* are two Points, 23° 30′ from the Poles of the World, represented by G and D.

The *Zodiack* is a *Zone*, having between eight and nine degrees of Latitude on either side the Ecliptick, and limits the Latitude of the Planets in their Revolution.

The *Meridians* are great Circles intersecting each other in the Poles of the World, and cutting the Equinoctial at Right Angles, as N. M. S.

The *Tropicks* are two small Circles, 23 deg. 30 min. distant from the Equinoctial, being parrallel thereto, and are the Limits of the Sun's greatest Declination; the North Tropick being marked with ♋ C, the South with ♑ B.

The *Polar Circles* are two small Circles, 23 deg. 30 min. distant from the Poles of the World, being parallel to the Equinoctial, as F G, and D Y.

The *Zenith* is a Point imagined in the Heavens, directly over our Heads, (*viz.*) 90 deg. distant from the Horizon, as Z.

The *Nadir* is a Point diametrically opposite to the *Zenith*, as R.

The *Azimuths* are great Circles intersecting each other in the *Zenith* and *Nadir*, and cutting the Horizon at Right Angles, Z. A. R.

The *Horizon* is a great Circle 90 deg. distant from the *Zenith* and *Nadir*, and divides the World into the Visible and Invisible Hemispheres, as H O.

The

The *Meridian* of a Place, is that Meridian which paſſeth by the *Zenith* and the *Nadir* of the ſaid Place.

Parallels of *Altitude*, or *Almicanters*, are ſmall Circles parallel to the Horizon, imagined to paſs through any degree of Altitude between the *Horizon* and the *Zenith*, as L P T.

Parallels of *Declination*, or *Latitude*, are ſmall Circles parallel to the Equinoctial, and are called Parallels of Declination, with reſpect to the Sun or Stars, and Parallels of Latitude reſpecting the Earth.

Circles of Longitude in the Heavens, are great Circles interſecting each other in the Poles of the Ecliptick, and interſecting the Ecliptick at Right Angles.

The *Latitude* of a Star, is an Arch of a Circle of Longitude, contained between the Center of the Star and the Ecliptick, and is accounted either northerly or ſoutherly.

The *Longitude* of a Star is an Arch of the Ecliptick, contained between the Circle of the *Longitude* of the Star, and the beginning of *Aries*, and is accounted aceording to the ſucceſſion of the Signs.

The *Declination* of the *Sun* or *Star*, is an Arch of the Meridian, contained between the Center of the *Sun* or *Star*, and the *Equinoctial*, and is accounted either northerly or ſoutherly.

The *Right Aſcenſion*, is the Degree and Minute of the Equinoctial that comes to the Meridian with the *Sun* or *Star*.

Oblique Aſcenſion, is an Arch of the Equinoctial contained between the beginning of *Aries*, and the Degree and Minute of the Equinoctial, that riſeth with the Center of the *Sun* or *Star*.

Oblique Deſcenſion, is the Degree and Minute of the Equinoctial, that ſets with the *Sun* or *Star*.

Aſcenſional Difference, is an Arch of the Equinoctial, contained between the Right and Oblique Aſcenſion.

The *Amplitude*, is an Arch of the Horizon, being the Diſtance of the riſing or ſetting of the *Sun* or *Star* from the Eaſt and Weſt, and is accounted either northerly or ſoutherly.

The *Latitude* of a Place, is the heighth of the Pole above the Horizon, or the diſtance between the *Zenith* and the *Equinoctial*.

Longitude on the Earth, is an Arch of the Equinoctial, contained between the Meridian of the place where the Longitude is aſſigned to begin, and the Meridian of any other place, and is accounted eaſterly.

Aſtronomical Problems uſeful in Navigation.

PROBLEM I.

THE Sun's Place and greateſt Declination given, to find its preſent Declination.

Example.

Suppoſe the Sun's Place to be 20° 30′ of *Gemini*, the greateſt Declination is (always) 23° 30′; it's required to find the preſent Declination.

The Operation by the Logarithms.

As Radius	10.00000
To S. Sun's greateſt Declination 23° 30′	9.60069
So is S. Sun's Longitude 80° 30′ from *Aries*	9.99400
To S. Sun's preſent Declination required, which is Nor. 23° 9′	19.59469

By the Gunter.

The Extent from Radius S. 90°, to S. 23° 30′, ſhall reach from S. 80° 30′, to S. 23° 9′, the Declination required.

Note, The Sun's Longitude is reckoned from the next Equinoctial Point: Therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquarius*, *Piſces*, the Longitude is accounted from *Aries*; but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, or *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs; *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, and *Piſces*, are called Southern Signs. Conſequently if the Sun's place be in any of the firſt ſix, the Declination is Northerly; but if in any of the latter ſix, the Declination is Southerly.

PROB. II.

The Sun's greateſt Declination and preſent Declination given, to find its Place.

Example.

The Sun's greateſt Declination is 23° 30′: the preſent Declination, ſuppoſe to be 18° 30′ North increaſing, and the Sun's place required.

By the Logarithms.

As S. of the Sun's greateſt Declination 23° 30′	9.60069
To Radius	10.00000
So is S. of the preſent Declination 18° 30′ North	9.50147
So the S. Sun's place in the Ecliptick required, 52° 43′	9.90078

That is one Sign, (30° making a Sign) and 20° 43′ from *Aries*, becauſe the Declination is North, and encreaſing, that is, in 22° 43′ of *Taurus*; but if the Declination had been decreaſing, it muſt have been accounted from *Libra*, and then it would have been 7° 17′ in *Leo*.

By

By the Gunter.

The Extent of the Compaſſes from the S. 23° 30′, the greateſt Declination, to Radius S. 90°, ſhall reach from S. 18° 30′, the Sun's preſent Declination, to the S. Sun's Place 52° 43′ required.

PROB. III.

The Sun's Place and greateſt Declination given, to find the Right Aſcenſion.

Example.

Suppoſe the Sun's Place to be 10° 30′ in *Aquarius*, and the Right Aſcenſion required.

The Operation by the Logarithms.

As Radius	10.00000
To Tang. of the Sun's Longitude from ♈ 49° 30′	10.06850
So is Sc. of the greateſt Declination 23° 30′	9.96239
To Tang. of Right Aſcenſion required 47° 02′	10.03089

By the Gunter.

The Extent from Radius S. 90°, to Sc. of the greateſt Declination 66° 30′, ſhall reach from Tang. Sun's Longitude from ♈ 49° 30′, to Tang. Right Aſcenſion 47° 02′ required.

Note, This Proportion gives the Right Aſcenſion from the next Equinoctial Point; but it ought to be accounted from *Aries*, according to the order and ſucceſſion of the Signs; and therefore in this laſt caſe 47° 02′ ſubtracted from 360° gives 312° 53′ the Right Aſcenſion required.

PROB. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude.

Example.

Suppoſe the Latitude 51° 32′ North, as the Sun's Declination 15° 20′ North, and the Amplitude required.

The Operation by the Logarithms.

As Sc. of the Latitude 51° 32′	9.79383
To Radius	10.00000
So is S. of the Declination 15° 20′ North	9.42231
To S. Amplitude required, which is 25° 09′	9.62848

By the Gunter.

The Extent from Sc. of the Latitude 38° 28′ to the S. of the Declination 15° 20′ North, ſhall reach from Radius S. 90° to S. Amplitude 25° 09′ North required.

Note, If the Declination be northerly, the Amplitude is northerly; if the Declination be ſoutherly, the Amplitude is alſo ſoutherly.

PROB.

PROB. V.

The Latitude of a Place, and the Sun's Declination given, to find the Aſcenſional Difference.

Example.

Suppoſe in the Latitude of 51° 32′ North, the Sun's Declination is 10° 45′ North, and the Aſcenſional Difference required.

The Operation by the Logarithms.

As Tang. 38° 28′ the Compl. Latitude	9.90008
To Radius	10.00000
So is Tang. 10° 45′ the Sun's Declination	9.27842
To S. 13° 49′ the Aſcenſional Difference required.	9.37834

By the Gunter.

The Extent from Tang. 38° 28′ to Tang. 10° 45′, ſhall reach from Radius S. 90°, to S. 13° 49′ required.

PROB. VI.

To find the Oblique Aſcenſion or Deſcenſion.

Firſt, Find the Aſcenſional Difference by the fifth Problem.

Secondly, The right Aſcenſion by the third Problem.

Then if the Sun's Declination be northerly, the Aſcenſional Difference ſubtracted from the Right Aſcenſion, gives the Oblique Aſcenſion, and added thereto, the Oblique Deſcenſion. But if the Sun's Declination be ſoutherly, the Aſcenſional Difference added to the Right Aſcenſion, gives the Oblique Aſcenſion, and ſubtracted, gives the Oblique Deſcenſion.

Note, That if the Aſcenſional Difference exceed the Right Aſcenſion, add to the Right Aſcenſion 360°, and then ſubtract the Aſcenſional Difference therefrom.

Or if both being added together exceed 360°, the Exceſs is the Oblique Aſcenſion or Deſcenſion required.

PROB. VII.

To find the Time of the Sun's Riſing or Setting, and length of the Day, find the Aſcenſional Difference by the fifth Problem.

Which converted to Hours and Minutes of Time, accounting for 15° one Hour, and for every deg. leſs than 15° 4′ of Time, and for every 15 minutes of Motion, 1 minute of Time.

If the Sun's Declination be Northerly, the Aſcenſional Difference added to ſix Hours, gives the time of Sun Setting, and ſubtracted, the time of Sun Riſing.

If the Declination be Southerly, contrarily the Aſcenſional Difference added, gives the time of Sun Riſing; ſubtracted, the time of Setting.

The time of Sun ſetting doubled, gives the length of the Day; the time of Sun riſing doubled, the length of the Night.

Example.

Example.

In Lat. 51° 32′ North, ſuppoſe the Sun's Declination 12° 15′ North.
The Aſcenſional Diff. 30° 27′, which reduced, is 2 hours 2 min. *ferè*.

	Add	6	0
Time of Sun Setting		8	2
Time of Sun Riſing		3	58
Length of the Day		16	4
Length of the Night.		7	56

PROB. VIII.

The Latitude of the Place, the Sun's Altitude and Declination given, to find the Azimuth.

Example.

In the Latitude 51° 32′ North, ſuppoſe the Sun's Declination to be 20° 30′ North, the Altitude 47° 30′, and the Azimuth required.

The Rule.

Take the Complement of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination to 90 deg. add them together, and take the half Sum; ſubtract the Compl. of the Declination from the half Sum, and take the Remainder: then ſet down the Compl. Arithmetical of the Signs of the Compl. Altitude, and Compl. Declination, and thereto add the Signs of the half Sum and Remainder, half the ſum of theſe four Logarithms, is the Sc. of half the Azimuth required.

Note, If the Declination be South in North Lat. or North in South Lat. inſtead of taking the Compl. of the Declination to 90°, there muſt be 90 deg. added thereto, and then proceed as before.

The Operation by the Logarithms.

S. 42°	30′	Compl. Altitude	Comp. Arith.	0.17032
S. 38	28	Compl. Latitude	Comp. Arith.	0.20617
69	30	Compl. Declination		
150	28	Sum		
S. 75	14	Half Sum.		9.98541
S. 5	44	Exceſs of the Half Sum above Compl. Declinat.		8.99955
			Sum	19.36145
		Sc. of 61° 21′	Half Sum	9.68072
	61	21		

Which doubled 122 42, is the Sun's Azimuth from the North required.

The Operation by Gunter's *Scale.*

The Extent of the Compaſſes from Radius S. 90°, to the S. 42° 30′, the Complement of the Altitude ſhall reach from S. 38° 28′, the Complement of the Latitude, to the S. of 24° 40′: then the Extent from S. 24° 40′ to S. 75° 14′ the half Sum, ſhall reach from S. 5° 44′ the exceſs of the half Sum, above the Complement Declination, to 122° 42′ (upon the Line of verſed Sines) which is the Azimuth required.

Example

Example 2.

In the Latitude 51 deg. 32 min. North, the Sun's Declination is 18 deg. 15 min. South, the Altitude 17 deg. 45 min. and the Azimuth from the North required.

The Operation by the Logarithms.

S.	72°	15′	The Compl. Altitude	Comp. Arith. 0.02119
S.	38	28	The Compl. Latitude	Comp. Arith. 0.20617
	108	15	Declination, 90 deg. being added, becauſe South.	
	218	58	Sum	
S.	109	29	Half Sum, Compl. to 180°, is 70° 31′	9.97439
S.	1	14	Remainder	8.33292
			Sum	18.53467
			Half-Sum	9.26733

Sc. of 79° 20′
79 20

Which doubled 158 40, is the Azimuth from the North required.

By the Gunter.

The Extent from Radius S. 90°, to the S. 72° 15′ the Complement Altitude, ſhall reach from the S. 38° 28′ the Compl. Latitude, to the S. 36° 20′, then the Extent from the S. 36° 20′, to S. 70° 31′ the Complement of 109° 29′ (the Half-Sum) to 180, ſhall reach from the Remainder S. 1° 14′, to 158° 40′ (upon the Line of verſed Sines) the Azimuth required.

In South Latitude, the Operation is the ſame with the two preceding Examples, only the Azimuth is found from the South.

After the ſame manner you may find the Azimuth of any Star.

PROB. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example:

In the Latitude 51° 32′ North, ſuppoſe the Sun's Declination 23° 30′ North, the Altitude 36° 30′ in the Afternoon, and the Hour from Noon required.

The Rule.

Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude to 90 deg. add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and take the Remainder; then ſet down the Complement Arithmetical of the Sine of the Complement Declination, and Complement Latitude, and thereto add the Sines of the half Sum and Remainder: half the Sum of theſe four Logarithms, is the Sc. of half the time required in degrees and minutes.

The

†

The Operation by the Logarithms.

S.	66°	30′	Compl. Declination	Comp. Arith.	0.03761
S.	38	28	Compl. Latitude	Comp. Arith.	0.20617
	53	30	Compl. Altitude		
	158	28	Sum		
S.	79	14	Half Sum		9.99221
S.	25	44	Remainder		9.63767
				Sum	19.87373
			Sc. of 30° 09′	Half Sum	9.93686

30 09

Which doubled 60 18 and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$ the time required.

But if it had been in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ ſubtracted from 12 hours, leaves 7 hours 58 min. $\frac{4}{5}$ for the time.

If the Declination had been Southerly, all the Difference in the Operation is, That inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, as in the ſecond Example of the eighth Problem.

By the Gunter.

The Extent of the Compaſſes from Radius S. 90° to S. 66° 30′, the Complement of the Declination ſhall reach from S. 38° 28′, the Complement Latitude to S. 34° 40′, then the Extent from S. 34° 40′ to the S. of 78° 44′ the half Sum, ſhall reach from the Remainder S. 25° 44′ to 60° 18′ (upon the Line of verſed Sines) required.

PROB. X.

Having the Latitude of the Place, the Sun's Right Aſcenſion, with the Right Aſcenſion, Declination, and Altitude of a Star given, to find the hour of the Night.

Example.

In the Latitude 51 deg. 32 min. North, on the 7*th* of *January* 1685, the Sun's Right Right Aſcenſion is 20 Hours, the Right Aſcenſion of the *Lions Tail* is 11 hours 32 min. the Declination 16 deg. 25 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the hour of the Night required.

The Rule.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Star's Altitude; add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and reſerve the Remainder; then ſet down the Complement Arithmetical of the Sines, of the Complements of the Stars Declination, and of the Latitude of the Place, and thereto add the Sines of the half Sum and Remainder: Half the Sum of theſe four Logarithms, is the Sc. of half the Stars diſtance from the Meridian.

The Operation by the Logarithms.

S. 73°	35′	Compl. Stars Declination	Comp. Arith.	0.01808
S. 38°	28′	Compl. Latitude	Comp. Arith.	0.20617
59	30	Compl. Stars Altitude.		
171	33	Sum.		
S. 85	46	Half Sum.		9.99881
S. 26	16	Remainder.		9.64596
			Sum	19.86902
		Sc. of 30° 40′	Half Sum	9.93451
		30 40		

Which doubled is 61 20 which reduced into Time, gives 4 hours 5 minutes $\frac{1}{2}$.

Note, If the Star be to the Eaſtward of the Moridian, then ſubtract the time produced by the Operation from 12 hours, (as in the Example foregoing), but if the Star be to the Weſtward of the Meridian, take the time produced by the Operation; to which adding the Star's Right Aſcenſion, and ſubtracting the Sun's Right Aſcenſion, gives the Hour of the Night: but if the Star's Right Aſcenſion added to the Time forementioned, be leſs than the Sun's Right Aſcenſion, add thereto 24 Hours, and then ſubtract it, and it gives the time of Night required.

4 Hours 5 min. ſubtracted from 12 hours (becauſe the Star is to the Eaſtward of the Meridian) leaves 7 hours 55 min. to which adding the Star's Right Aſcenſion 11 hours 32 min. makes 19 hours 27 min. to which adding 24 hours, makes 43 hours 27 min. ſubtract the Sun's Right Aſcenſion 20 hours, and there remains 23 hours 37 min. which being accounted from the preceding Midnight, (as it muſt always be) gives 11 hours 27 min. for the time of Night required.

Note further, If the Star's Declination be South, and the Obſervation made in North Latitude, or Declination North in South Latitude, inſtead of taking the Complement Declination to 90 deg. there muſt be 90 deg. added to it, as hath been ſhewn in the eighth and ninth preceding Problems.

The Operation by Gunter's *Scale.*

The Extent of the Compaſſes from Radius S. 90, to the S. of 73 deg. 35 min. the Complement of the Star's Declination ſhall reach from the S. 38 deg. 28 min. the Complement of the Latitude, to S. of 36 deg. 40 min. then the Extent from S. 36 deg. 40 min. to S. 85 deg. 46 min. the half Sum, ſhall reach from S. 26 deg. 16 min. the Remainder to 61 deg. 20 min. (upon the Line of Verſed Sines) required: with which proceed, as hath been directed, to find the Hour of the Night.

A RUTTER,

Containing the Courſes and Diſtances of ſome of the moſt eminent Places on the Coaſts of England, Scotland, *and* Ireland, France, Spain, *and* Portugal. *As alſo the Thwart Courſes between the Eaſt Coaſt of* England *and* Holland, *the South Coaſt of* England *and* France, *and the Weſt Coaſt of* England *and* Ireland.

The Eaſt Coaſt of England *and* Scotland.

	Leag.
From the *North Foreland* to the North end of *Goodwin*, E. by S.	01½
From the *North Foreland* to *Kentiſh Knock*, N. by E.	05
From the *North-Foreland* to *Orfordneſs*, North	14
From the *Galloper* to *Orfordneſs*, N. N. W.	10
From *Leyſtaff* to *Yarmouth*, North	02
From *Yarmouth* to *Winterton*, N. by W.	02½
From *Cromer* to *Blackney*, W. N. W.	03½
From *Blackney* to *Burnham* within the Sand, Weſt	06½
From the *Spurn* to *Flamborough Head*, N. N. W.	09
From *Scarborough* to *Whitby*, N. W. by W.	05
From *Whitby* to *Tinmouth*, N. W.	14
From *Tinmouth* to *Coquet-Iſland*, N. N. W.	09
From the *Staples* to *Berwick*, W. N. W.	03
From the *Staples* to St. *Abbs-Head*, N. W.	07½
From *Aberdeen* to *Boekneſs*, N. N. E.	12
From *Boekneſs* to *Cateneſs*, N. W.	21

Thwart Courſes from England *to* Holland, *&c.*

From the *Foreland* to *Fluſhing*, Eaſt Northerly,	27
From the *Foreland* to the *Teſſel*, N. E.	45
From *Orfordneſs* to the *Teſſel*, E. N. E.	37
From the *Spurn* to the *Teſſel*, E. by S.	59
From *Tinmouth* to the *Naze* of *Norway*, N. E. by E.	102
From *Tinmouth* to *Holy Land*, E. by S.	106
From *Tinmouth* to the *Scaw*, E. N. E.	135

From *Yarmouth* to the *Teſſel*, E. N. E. —— 34
From *New-Caſtle* to *Maers-deep*, E. N. E. —— 83
From *Aberdeen* to *Maers-deep*, S. E. —— 113
From *Dover* to the *Maes*, N. E. by E. —— 34
From the *North-Foreland* to the *Maes*, E. N. E. —— 32
From *New-Caſtle* to the *Fly*, E. S. E. —— 90
From *Scarborough* to *Holy-Land*, Eaſt, northerly —— 93

The South Coaſt of England.

From *Dover* to *Dungeneſs*, S. W. by W. —— 06
From *Dungeneſs* to *Fairlee*, W. S. W. —— 03½
From *Fairlee* to *Beachy*, W. S. W. —— 05
From *Beachy* to the *Owers*, Weſt by South, —— 13
From the *Needles* of the *Wight* to *Portland*, W. S. W. —— 12½
From *Portland* to *Torbay*, Weſt, Southerly —— 12
From *Portland* to the *Start*, W. S. W. —— 16½
From the *Start* to the *Ramhead*, W. N. W. —— 08
From *Falmouth* to the *Lizard*, South by Weſt, —— 04
From the *Start* to the *Eddy-Stone*, Weſt —— 08
From the *Start* to the *Lizard*, Weſt by South —— 20
From the *Lizard* to the *Lands-End*, W. N. W. —— 09
From the *Lands-End* to *Silly*, W. S. W. —— 08

Thwart Courſes from the South Coaſt of England *to* France.

From the *Caskets* to *Blackneſs*, E. N. E. —— 48
From *Beachy* to *Blackneſs*, Eaſt —— 20
From the Iſle of *Wight* to *Diep*, E. S. E. —— 37
From *Dover* to *Diep*, South —— 23
From *Portland* to *Seynhead*, S. E. by E. —— 38
From *Beachy* to *Struyſart*, South —— 24
From *Dover Point* to *Struyſart*, S. S. W. —— 33
From *Beachy* to the *Caſquets*, S. W. by W. —— 37
From *Portland* to the *Caſquets*, Eaſt, Southerly —— 13
From *Silly* to the *Caſquets*, Eaſt, Southerly —— 56
From the *Lizard* to *Garnſy*, Eaſt by South —— 37
From the *Start* to *ſeven Iſles*, South by Eaſt —— 24
From the *Lizard* to *Paul de Lion*, S. W. by S. —— 29
From *Portland* to *Paul de Lion*, S. W. by S. —— 40
From *Silly* to *Uſhant*, S. E. by S. —— 37
From the *Lizard* to *Uſhant*, South —— 29

From.

From the *Start* to *Uſhant*, S. W. by S. ——— 40
From *Portland* to *Uſhant*, S. W. ——— 53

The Weſt Coaſt of England.

From *Silly* to the Cape of *Cornwal* N. E. ——— 09
From the Cape of *Cornwal* to St. *Ives*, E. by N. ——— 06
From St. *Ives* to *Stoopert-Point*, N. E. by E. ——— 09
From *Stoopert* to *Hartland-Point*, N. E. by N. ——— 09
From St. *Ives* to *Hartland-Point*, N. E. ——— 18½
From *Hartland-Point* to the Iſle of *Lundey*, North ——— 04
From the Weſt-end of *Lundey* to *Biddiford*, E. S. E. ——— 05
From *Lundey* to the *Holms*, E. N. E. ——— 20
From *Steepholm* to the River of *Briſtol*, N. E. by E. ——— 12
From *Steepholm* to the *Naez*, W. N. W. ——— 06½
From the *Naez* to St. *Gawens Point*, Weſt, northerly ——— 17
From St. *Gawens Point* to *Milford-Haven*, N. W. by N. ——— 04
From the Iſland *Scalm* to *Ramſey*, N. N. W. ——— 01½

The Coaſt of Ireland.

From the South end of the *Saltees* to *Black-Rock*, N. E. by E. ——— 02½
From the *Saltees* to *Tuſcar*, E. N. E. ——— 05
From *Black-Rock* to *Tuſcar*, E. N. E. ——— 03
From *Green Bay* to the Bar of *Waſhford*, North, Weſterly ——— 01½
From the Bar to *Waſhford*, ——— 02
From *Arkelo* to *Mizan-Head*, N. by E. Eaſterly ——— 02
From *Nicaſtle* to the Point of *Brahe*, North, Weſterly ——— 02
From *Brahe Head* to the Iſland *Dalk*, North by Weſt, ——— 02½
From *Dalk* to the Bar of *Dublin*, N. N. W. ——— 02
From the Bar of *Dublin* to the City, W. S. W. ——— 02½
From *Lambay* to *Carlingford*, N. by W. ——— 13
From *Lambay* to the *South-Rock*, N. N. E. ——— 21
From the *North* and *South-Rock* to *Copeland-Iſles*, N. N. W. ——— 06½
From *Copeland-Iſles* to *Knock-fergus Bay*, N. W. ——— 05
From *Lough-Swilly* to *Sheep-Haven*, W. S. W. ——— 04
From the Iſland *Tore* to the Iſles of *Aaron*, S. W. by S. ——— 09
From *Telling-Head* to *Kilbegh*, E. S. E. ——— 05
From *Black-Rock* to *Ackle-Head*, S. E. ——— 01
From *Slynehead* to *Galloway Bay*, S. E. ——— 09
From the Bay of *Galloway* to *Blaskes*, S. W. by S. ——— 21
From *Dingle Haven* to *Shellock*, S. W. by S. ——— 07

From

From *Cape Dorſey* to *Mizan-Head*, E. S. E. ——— 08
From *Sheeps-Head* to *Beer-Haven*, N. by W. ——— 02½
From *Beer-Haven* to the Iſland *Whiddy*, E. N. E. ——— 08
From *Mizan Head* to *Cape Clare*, E. by S. ——— 06½
From *Cape-Clare* to *Old-Head*, E. by N. ——— 13
From *Old Head* to the Haven of *Kinſail*, N. by E. ——— 01½
From *Old-Head* to *Cork*, N. E. by E. ——— 05
From *Cork* to *Waterford*, E. N. E. ——— 19

Thwart Courſes from England *to* Ireland.

From *Groſholm* to *Waterford*, W. by N. ——— 21
From the Rock *Maſcus* to *Tuſcar*, W. by N. ——— 08
From the Rocks *Smales* to *Tuſcar*, N. W. by. N. ——— 10½
From the Lands-end of *England* to *Tuſcar*, N. by W. ——— 40
From theLands-end of *England* to *Waterford*, N. N. W. ——— 40
From the Holy Hill in the Iſland of *Angleſey* to the Bar of *Dublin*, Weſt by North. ——— 18½
From *Rokol* to *Black Rock*, S. by E. ——— 80
From *Silly* to *Cape Dorſet*, N. W. by W. ——— 56
From the Lands-end of *England* to *Cape Clare*, N. W. by W. ——— 53
From *Silly* to *Cape Clare*, North-Weſt. ——— 46
From the Lands end of *England* to *Old-Head*, N. W. ——— 45

The Coaſt of France, Spain, *and* Portugal.

From the *Fourn* to St. *Matthews-Point*, S. S. E. ——— 04
From St. *Matthews-Point* to the Race of *Fountnay*, S. by E. ——— 05
From *Gloyland* to *Groy*, Eaſt ——— 09
From *Gloyland* to *Bell-Iſle*, S. E. by E. ——— 12
From the *Weſt-Pens* to *Bell-Iſle*, E. S. E. ——— 21
From the E. point of the *Cardinal* to the Mouth of *Morbeam*, N. N. W. 04
From the *Cardinal* to *Old-Downs*, E. N. E. ——— 06½
From *Armentiers* to the Weſt-end of *Uſe*, S. by E. ——— 07
From the Eaſt-end of *Bell-Iſle* to *Uſe*, South-Eaſt Eaſterly, ——— 16
From *Uſe* to the *Band* of *Oleron*, S. E. by E. ——— 16
From *Bayon* to *John de Luz*, S. by W. ——— 04
From *John de Luz* to St. *Sebaſtians*, Weſt. ——— 08
From *Cape Martinhaco* to *Bilboa*, S. S. W. ——— 06½
From the Point of *Bilboa* to *Caſtro*, Weſt. ——— 05
From *Bilboa* to St. *Anthony*, W. by N. ——— 10

From

From St. *Antony* to the Weſt Point of *Andero*, Weſt ——— 05
From *Andero* to *Cape de Pinas*, Weſt, northerly ——— 38
From *Cape Pinas* to *Avilles*, S. S. W. ——— 02½
From *Cape Pinas* to *Ribadeus*, S. W. by Weſt ——— 14
From *Cape Pinas* to *Ortegal*, Weſt by North, Weſterly ——— 29
From *Siverus* to *Cape de Prior*, S. W. ——— 05
From the *Groyn* to *Ciſarga*, Weſt ——— 08
From *Ciſarga* to *Cape de Bylem*, S. W. by W. ——— 12
From *Cape de Bylem* to *Cape Coriane*, S. W. ——— 02½
From *Cape Coriane* to *Cape Finiſterre*, South ——— 02½
From *Cape Ortegal* to *Cape Coriane*, S. W. by W. ——— 33
From St. *Sebaſtian* to *Bell-Iſle*, N. N. W. northerly ——— 80
From *Cape Martinchaco* to *Arcaſon*, N. E. Eaſterly ——— 28
From *Cape Martinchaco* to *Uſe*, North, Eaſterly ——— 60
From *Cape Pinas* to the Tower of *Cordan*, E. N. E. Eaſterly ——— 72
From *Cape Pinas* to *Bell-Iſle*, N. N. E. ——— 80
From *Cape de Ortegal* to *Waterford* in *Ireland*, North ——— 168
From *Ciſarga* to *Silly*, North by Eaſt ——— 137
From *Cape Finiſterre* to *Port a Port*, S. S. E. ——— 44
From *Cape Finiſterre* to *Avero*, South by Eaſt ——— 53
From *Cape Finiſterre* to the *Burlings*, South ——— 67
From *Port a Port* to *Avero*, South ——— 10
From *Cape Montego* to the *Burlings*, S. W. ——— 13
From the *Burlings* to *Roxent*, South by Eaſt, Eaſterly ——— 16
From *Cape Pitcher* to *Cape* St. *Vincent*, South Eaſterly ——— 29
From *Cape Finiſterre* to the *Lizard*, N. N. E. ——— 153
From *Villa Nova* to *Cape* St. *Maries*, Eaſt by South ——— 09
From *Cape* St. *Maries* to *Saltees*, E. N. E. ——— 24
From *Cape* St. *Vincent* to *Cape* St. *Maries*, Eaſt ——— 18½
From St. *Lucas* to the Point of *Cales*, S. E. ——— 09
From *Cales* to the *Straits Mouth*, S. S. E. ——— 10
From the Paint of *Gibralter* to *Malaga*, N. E. ——— 24
From *Malaga* to *Veles Malaga*, Eaſt, northerly ——— 06½
From the Point of *Gibralter* to *Cape de Gat*, Eaſt by North ——— 66
From *Cape* St. *Vincent* to *Cape Cantin*, South ——— 86
From *Cape* St. *Vincent* to *Cape de Geere*, South, Weſterly ——— 133
From *Cape* St. *Maries* to the *Straits*, E. S. E. Southerly ——— 45
From *Cape* St. *Maries* to *Cape Cantin*, South by Weſt ——— 90

A Table of the Soundings coming into the Chanel, reſpecting the Bearings and Diſtances from Silly, Uſhant, *the* Lizard, *&c. With the various ſorts of Ground.*

Bearings.	Diſt.	Lat. D. M.	Dep.	*The various ſorts of Grounds.*
South.	05	50.20	5	Branny ſand like ground Wheat.
S.S.E.	05	50.12	4	White ſand mixed with ſhells.
S.S.E.	02		50	Coarſe Owſe.
E.S.E.	06		53	Coarſe ſand and fine red ſhells.
E. by S.	08	50.12	58	Owſy ſand with Queen-ſhells amongſt it.
E. by N.	07	49.15	72	Owſy like Muſtardſeed, with broken ſhells.
E. by N.	15	48.50	72	Peppery ſand black and yellow.
E. by N.	25	49.50	72	Black, white and red ſtones, with Owſe.
E.N.E.	07	49.15	60	Some black ſand.
E.N.E.	20	49.15	80	Rocky ground.
E.N.E.	55		103	Fine white ſand.
N.E. by E.	22	49.10	85	Sand and Owſe together.
N.E. by E.	10	49.20	55	White and red ſand mixed with ſhells.
N.E. by E.	50	49.50	100	White ſand with Owſe and Nits.
N.E. by E.	25	49.50	64	Branny ſand with white and red ſhells.
N.E. by E.	06	49.10	48	Black ſand.
N.E. by E.	13	49.43	65	Branny ſand with ſome pieces of ſhells.
N. E.	10	49.40	65	Branny ſand, Herring bones, ſmall ſtones.
N.E. by N.	10	49.20	57	Small red ſand.
N.N.E.	100	49.47	102	White ſand then entring on the Bank.
N. by E.	18		68	Red ſand with black & white ſcollop ſhells.
North.	12	49.15	65	Broken ſhells with white and red ſand.
North.	10	49.47	65	White ſand on the Eaſt part of the Bank.
N.N.W.	33	48.52	77	Red ſand and ſhells amongſt it.
N.W. by N.	07	49.40	54	More ſhells, the *Lizard* N. E. diſt. 18 leag.
N.W.	04	50.10	50	Branny ſand, with black and broken ſhells.
N.W.	07	49.47	60	Stony ground.
N.W. by W.	04	50.25	61	Red and black ſand with gliſtering ſhells.
N.W. by W.	2½		44	Shells and ſand like points of Needles.
W. by N.	13	50.25	63	Fine white ſand with a little Owſe.
Weſt.	21	50.08	66	Red and black ſand with gliſtering ſhells.
W. by S.	32	49.50	75	Fine white ſand and ſmall gliſtering ſhells.
W. by S.	3½		40	Like broken Wheat or coarſe Bran.

Silly.

Bearings

	Bearings.	Dist.	Lat. D. M.	Dep.	*The various ſorts of Ground.*
Uſhant.	*North.*	06	48.36	63	Full of ſmall Mace ſand.
	N. by E.	18	48.15	80	Round ſtones mixed with Scollop ſhells.
	N.E. by N.	11		60	Small beaten ſhells and Hakes teeth.
	N.E.	29	48.50	85	Great and ſmall pieces of Cockle ſhells.
	N.E.	25	48.10	55	Gray and brown ſand with white ſhells.
	N.E. by E.	07	48.30	68	White and gray Mace ſand.
	E.N.E.	14	48.36	68	Small ſhells and Herring-bones.
	E. by N.	25	48.30	85	White & gray ſand with ſmall red ſtones.
	Eaſt.	18	49.00	70	Branny ſand and ſome ſhells.
	Eaſt.	06	48.00	65	Red ſand, ſhells, things like Needles points.
	Eaſt.	15	49.15	70	Fine white ſand.
	Eaſt.	33	49.15	87	Dazling ſand like Barley-ſtraw.
	Eaſt.	04	49.10	06	Full of Mace ſand and broken ſhells.
	E. by S.	04	48.56	63	Shells like Periwincles.
	E.S.E.	15	49.15	70	Shells, gray and red pieces of Cockle-ſhells.
	E.S.E.	12	49.20	68	Groſs white ſand with ſhells.
	E.S.E.	08	49.05	64	White ſhells and fine ſmall ſtones.
	E.S.E.	06		60	Hakes teeth, and ſhells like Oatmeal husks.
	S. E. by E.	20	49.15	72	Great ſtones like Beans and Peaſe.
	S. E. by E.	09	49.15	65	Sand and ſome ſhells.
	S. E. by E.	07	48.30	65	*James*'s ſhells.
	S. E. by E.	15	49.25	60	Small ſcollop ſhells with ſmall ſtones.
Lands-end.	*North.*	6½		50	Like husks of Oatmeal and ſmall ſtones.
	N. by W.	01		33	Rocky ground.
Lizard.	*N.E.*	6½		48	Maſhy ſhells, and ſome ſcollop ſhells.
	N.E. by N.	10		53	Maſhy ſhells and Hakes teeth.
	N. N.E.	09		50	Maſhy ſhells like Oatmeal husks.
	N. by E.	15		58	Maſhy ſhells and Hakes teeth.
	North.	01		39	Stones as big as Beans, ſo four leagues off.
	N.W.	05		45	Gray ſand like Oatmeal-flower.
	N.W.	03		43	Maſhy ſhells and ſmall ſtones.
	W.N.W.	0½		45	Small ſhingly ſtones and maſhy ſhells.
	W. by N.	04		40	White maſhy ſhells and white ſtones.
	W. by S.	30		41	Black gravelly ground with ſmall ſtones.
	N.E. by E.	12		57	Scollop ſhells.
	N.E. by E.	04		44	Great ſtones and rough ground.

	Bearings.	Dif.	Dep.	*The various ſorts of Ground.*
Eddyſtone.	*N.* ½ *mile.*		35	Dirty brown Sand and Hakes Teeth.
	W. 2 *miles.*		34	Dirty brown Sand.
	S. 1 *mile.*		26	Fine Sand, and within this 28 and 30 Fathom.
Start.	*N.by E.Nly.*	8½	40	Like the Duſt of a Grindſtone, with Hakes teeth and ſhells.
	N.W. by W.	4½	43	
	N.W. by N.	03	38	Gravelly Sand, ſmall Stones and Shells.
	N.by W.Wly	12	38	Reddiſh Shells maſhed as if beaten in a Morter, white Sand and Scollop-ſhells.
	N.W. by W.	14	42	
Portland.	*N. E. by E.*	08	35	Small ſhingle Stones as big as Peaſe.
	North	08	40	Streamy Ground with ſmall Stones.
	N. by E.	5½	33	The ſame with ſome black Sand.
	N. E. by N.	11	41	Fine Sand and Scollop-ſhells.
	N. N. E.	08	40	Fine Sand, Scollop-ſhells, and ſmall Stones.
	N. E. by E.	2½	27	Shingly Ground.
	W. N. W.	2½	20	Small Stones.
Needles.	*N. E. by E.*	02	17	Great ſhingly Ground.
	N. E. ½ *E.*	2½	19	Small ſhingly Ground.
	N. E.	02	13	Rocky Ground.
Body of the Iſle of Wight.	*N. by W.*	3½	20	All the Ground from *Albions* to the Eaſt end of the *Wight* is Chalky, it makes dents in the Tallow, and nothing comes up but brown Sand in rowls, which will crumble in your Fingers.
	E. by N.	04	21	
	N. by E.	03	18	
	North.	03	18	
	N. by W.			
Dunnoſe.	*W. by S.*	04	16	Rough Ground with ſome big Stones.
	Weſt.	04	21	A kind of ſandy Fiſhing Ground.
	W. N. W.	08	33	Fiſhing Ground ſomewhat red, with Stones as
	W. by N.	06	26	big as Peaſe, and ſome as Beans.

Directions to Sail into ſome of the Principal Harbors on the Coaſt of *England*.

Directions to Sail into Silly.

Silly is divided into divers Iſlands; along the Weſt ſide lieth a great many Rocks. There are ſeveral Channels through which to go in; but the ſouthermoſt, called St. *Mary*'s Sound, is the beſt, being a fair opening of a Channel; but near the midſt lie two ſunken Rocks, which in foul Weather the Sea may be ſeen to break over; it is beſt to leave them on the Larboardſide going in, and on the Starboard coming out; go ſo near the Starboard Shore, as that a Stone may be almoſt thrown on-ſhore; and when you are within the Point, luff up round and come to an Anchor in ſight of the Houſes; or when the Town is brought open with the Valley, leave two thirds of the Harbor on the Larboard-ſide.

Directions to Sail into Mounts-Bay.

If you are bound into *Mounts-Bay* with an eaſterly Wind, keep not too near the *Lizard* Shore, eſpecially at the *Manacles*, for without the *Manacles* there are ſunken Rocks. To avoid which, be ſure to keep ſo far off the Shore, that all the Spire of the Steeple, called *Keveron*, may be ſeen above the Land; ſo ſhall ye go clear of them unto the *Lizard* Point; from whence there lieth a Ledg of Rocks, which all ſhew themſelves at Low-water. About five Leagues North-weſt from the *Lizard*, lieth *Mounts-Bay*, on the Eaſt-ſide of which is a high Land, whereon ſtands a Caſtle called S. *Michael*'s Mount; to the Eaſtward of which lies a great range of Rocks from the Land a League into the Sea, whereof be ſure to be careful in dark Weather; from thence to the Southward towards the *Lizard* the Coaſt is very full of Rocks, but lie not far off the Shore.

To ſail into *Mounts-Bay*, coming from the *Lands-end*, or the *Lizard*, the Ground is very clear all over, and fine Sand unto a Mile of the Shore, between 20 and 23 Fathom.

To Sail into Foy.

To Sail into *Foy*, it is neceſſary to have at leaſt half-Flood; run in amidſt the Channel between the two Points; and being come within, chuſe either ſide, but the moſt Water is by the Weſt-land, between the *Stakes* and the ſquare Steeple. Being come within the *Stakes* (as you come in by the Land) bear ſomewhat off preſently from the Weſt-ſhore, almoſt into the midſt of the Channel neareſt the Weſt ſhore, until you come before the Village that lieth on the Weſt ſide; where is a deep Dock, in which Ships that draw 16 Foot may lie afloat at Low-water; four Ships may lie in the ſaid Dock.

To Sail into Falmouth.

Four Leagues South-weſt by South from *Foy*, lieth *Dead-mans Head*, and two Leagues to the weſtward lieth the Haven of *Falmouth*; upon the Weſt point of the Haven of *Falmouth*, ſtandeth a Caſtle upon the high-Land, called *Pendennis*: In the entry neareſt the Weſt ſide, lieth a great Rock above Water, you may ſail in at either ſide of it;

at the inner ſide of the Eaſt point lie alſo ſome Rocks off the Shore; on the Eaſt ſide is deepeſt Water and moſt room, therefore in going in, give the Eaſt point a large birth, there will be ſeven or eight Fathom: Keep the ſaid Shore till you come within St. *Maudes*-Caſtle; which when it bears Eaſt, there will be 16 or 17 Fathom; but half the Harbor over towards *Smithick* is but 4 or 5 Fathom: Obſerve in going in, to keep the *Manacles* open and ſhut on the Point of *Falmouth*-Caſtle; and ſo it muſt be kept till you ſhut the Church over *Penny-Comquick* into the North-eaſt end of the *Smithick*, and ſo bear over to St. *Maudes*, and ride with the Caſtle Eaſt, laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in 4 Fathom, as ſhall ſeem convenient.

To Sail into Plimouth.

Seven Leagues to the Weſtward of the *Start* lieth *Plimouth-Sound*; at the Eaſtermoſt point of the *Sound* lieth an high round Rock called *Mawſtone*; between it and *Rambead* lieth the ſaid *Sound* N. N. E. being round and deep.

A little to the Northward of *Rambead* is a fair Sand-Bay, where is good anchoring cloſe under the Land, in 9 or 10 Fathom. Two Leagues South, a little Eaſterly from *Rambead*, lies a Rock above Water called the *Eddyſtone*: the Point of *Plimouth* lieth from it North by Eaſt, and N. N. E. diſtant about four Leagues.

In the *Sound* by the Land of *Plimouth* lieth an Iſland, called *Drakes-Iſland*, which is faſt to the Weſt ſide, with a range of Rocks under Water; ſo that you muſt ſail along to the Eaſtward of it.

To Sail into Catwater.

To Sail into *Catwater*, Run in between the Iſland and the Point on the Eaſt-ſide, in which is the Land of *Plimouth*, till *Catwater* open on the Starboard; then go in to the Eaſtward between the Point of *Plimouth*, and the Point on the Starboard-ſide, leaving moſt part of the Channel on the Starboard-ſide until you come within the Point; and anchor there right againſt the high ſteep Northern Land; there is at Low-water, with extraordinary Tides, 4 and 5 Fathom.

In ſailing into *Catwater*, be ſure to give a good birth to the Southern Point of the Entry, for there lies off the ſame Point a Ledg of Rocks under Water, about two Cables length off from the Land. Upon the point of the Ledg lies a Buoy, where is about 12 Foot Water at half-Flood, which Buoy muſt be left on the Starboard-ſide going in; and when *Catwater* is altogether open, you may run in to the Eaſtwards, leaving in the entry of the Harbor two thirds of the Channel on the Starboard-ſide as aforeſaid, becauſe the South Shore is ſomewhat flat off, there lying a Sandy Bank, which reacheth to the ſecond Point of the South Shore of *Catwater*.

A little to the Eaſtwards of *Drakes-Iſland*, lies a Rock under Water; upon which at Low-water, it is no deeper than two Fathom. To ſail within the Land, you may go to the Eaſtward or Weſtward of the Rock, as occaſion ſerves.

To Sail into Dartmouth.

Three or four Leagues to the Weſtward of *Torbay*, lies the Haven of *Dartmouth*, which hath a narrow entry lying in between two high-Lands: On each ſide of the Haven ſtandeth a little Caſtle; on the Weſt ſide is a Church on the high-Land, called St. *Patrick*'s Church. To ſail in coming from the Weſtward, run in along by the Weſter-Land, ſo far to the Eaſt-ward, until the Key of the Village (on the Eaſt-ſide of the Haven) be brought in the midſt of the entry of the Haven between the two Lands; it is convenient to have the Boat ready (if any guſt of Wind ſhould come from the high-Land) to row in: Being come in, edg over to the Weſt ſide before the

the Brewhouſe, and anchor there in 10 or 11 Fathom; or before the Village on the Eaſt ſide at pleaſure. At the Eaſt ſide lieth a ſunken Rock, to avoid which, ſteer in with St. *Patrick*'s-Church, and do not bring the Village, which ſtandeth on the Weſt ſide of the Harbor, without the ſaid Church, but keep the outer Houſe of the ſaid Village in the Eaſt ſide of the Chappel, and always in ſight without the Bulwark, on the North-ſide, by St. *Patrick*'s Church, then there is no danger of the Rock in the *Range* by the North Point. Between *Dartmouth* and the *Start* neareſt to *Dartmouth*, ſtandeth a white Spire Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To Sail into Torbay.

To go into *Torbay*, bring the Weſt Point, or the Berry, South by Eaſt, or S. S. E. from you; and anchor there in 7 or 8 Fathom, where you ſhall be Land-lockt for a South and South-weſt Wind. At the North-eaſt end of the Bay is alſo a Tide-Haven, called the *Tormain*; before it is very good Anchor-ground, in 4 or 5 Fathom, according as is deſcribed to be nearer or farther from the Shore.

Directions for Sailing in at the Eaſt end of the Iſle of Wight *to* Portſmouth *Harbour, and alſo to* Hampton.

If you come from the Eaſtward with a Northerly Wind, bound into the *Iſle of Wight*, or *Portſmouth*; after you are come to the Weſtwards of the Shoal, called the *Owers*, hale in North-weſt with St. *Hellen*'s Point, but do not hale too much to the Northwards, for there lieth a Bank off *Longſtone*-Haven, to the Eaſtwards of the *Horſe*, that hath not above 13 Foot on it at Low-water; but keeping of the Lead in 7 or 8 Fathom, carrieth you clear without it, and will bring you to the South-eaſt end of the Sand called the *Horſe*. St. *Hellen*'s Church being South-weſt by Weſt from you, you may run in five Fathom; and when you have brought the Weſtermoſt great white Patch, or Chalk, upon *Parch-Down* (which is the high-Land to the Northwards of *Portſmouth*) a Ships length to the Weſtwards of *South-Sea* Caſtle, that ſtands upon the Beach, then you may luff up without fear: Being then to the Weſtward of the *Horſe*, and ſteering with that Mark, it will lead you in alongſt the *Horſe* unto the Beach, and ſo into the Harbour of *Portſmouth*, keeping along cloſe by the Shore, until you come to the Town-wall's end, and there you muſt bear off a little for a Flat that lieth off from the Shore; this is for an Eaſterly Wind. But if you intend for *Stoaks-Bay*, when you have brought the Fire-Beacons on *Brown-Down*, which is to the W.N.W. of *Hazlewood* Point, within a Ships length without the ſaid Point, then you may bear to the weſtwards along the out-ſide of the *Spit-head*, which is the Shoal on the Weſt ſide of the Entry of *Portſmouth*-Haven.

If the Wind be weſterly or ſoutherly, and you are coming from the weſtward, and deſign for St. *Hellens*-Road, or *Stoaks*-Bay, from *Dunnoſe* to St. *Hellens* Point, the Courſe is North-eaſt by North, and N. N. E. but borrow no nearer to St. *Hellens* than 6 or 7 Fathom, for the *Spit* lies off a great way; but if it be clear Weather, that you may keep *Sand-down* Caſtle open of the *Culver-Cliff*, that Mark will lead without the Spit of the Point; and ſteering along in this Mark, until you open St. *Hellens* Church ſome two Ships length open of the *Red-Cliff* within St. *Hellens* Point, or *Port-Sea* Caſtle, to the Eaſtwards of *South-Sea* Caſtle, then are you clear of the Point, and may ſteer to St. *Hellens* Road North-weſt; and having brought the Point South by Weſt, or between that and the South by Eaſt, you may anchor in 7 or 8 Fathom, very good Ground.

Note,

Note, That you have no good clear Ground all along the Iſland, until you have opened St. *Hellens* Church as aforeſaid, and have brought the Point to bear from you S. S.W.

From St. *Hellens* Point to go between *No-mans-land* and the *Horſe*, the direct Courſe in, is North-weſt by North, and North-weſt; but you have no ſhoaling upon the South-weſt ſide of *No-mans-Land*, for you ſhall have 16 Fathom, and the next caſt but 3; but at the *Horſe* you may ſtand in 10, 9, or 8 fathom: If the ſtrong Tide be ſpent and ſmooth Water, you ſhall have a great waſhing of them by the overfall of the Water: But eſpecially on *No-mans-Land*, if it be clear Weather. There are very good Marks to lead you in, which are as follows; Keep the two Windmills on the *Downs* on the *Iſle of Wight*, that they may be ſeen clear over all the Trees between you and them, but no more above them than even clear; and this Mark will lead you in, and ſo up along the Iſland without ſome middle Ground that lieth W. S. W. off the Point of *No-mans-Land*.

Alſo from St. *Hellens* Point (if it be clear Weather that you can ſee it) there is a direct Mark, (*viz.*) a piece of an old Caſtle, heretofore called *Hazlewood*-Caſtle, ſtanding on *Kilkeker* Point, (which of late is kept white) keep *Gosbere* Church and that both in one, or this Mark in the middle of the Wood about the Church, which ſheweth with a Valley like a Saddle, and ſo you may run directly in without fear. Or if the Wind be ſo that you are forced to turn it in, then you may turn the ſaid Mark within two Sails breadth of each end of the Wood. In the middle of the Channel is eighteen fathom Water; and if you bring the ſaid Mark right under the North end of the Wood, you ſhall run in a middle Ground near the *Horſe*, that hath not above ten Foot on it at low Water, and hard Sand.

To ſail within the Wight *in thick Weather.*

To ſail between the *Main* and the *Wight* in thick Weather, borrow in 6 Fathom of St. *Hellens*, and ſteer North-weſt by North, and N. N. W. from St. *Hellens* Point, till you have 12 Fathom, and then ſteer more weſterly as you find the Depth; come no nearer *No-mans-Land* than 9 or 10 Fathom; in that depth you may keep along the *Wight*-ſide, if the Wind be Southerly; but if it be large, keep in 14 or 15 Fathom, which is a good birth from both ſides; and ſo ſteer Weſt by South, and W. S. W. as you find the depth, until you come to *Cowes*. *Note*; That being about *Stoakes-Bay*, there will be leſs VVater; if you go near to *Cows*, there you may anchor in 12 or 14 Fathom, in the midſt of the Channel, where is good oazy Ground.

Directions for Dover *Road.*

The beſt Ground in *Dover*-Road is with the *White-way* to the North-weſt of *Dover*-Caſtle; or between that Hill that comes from St. *James*'s Church, which is a flat Steeple at the North-end of *Dover*-Town, for a thwart Mark, and in what depth you pleaſe, from 7 to 14 Fathom. Thwart of *Foulſtone* in 12 or 14 Fathom is very good Ground.

Directions to ſail from the North-Foreland *through the* Gulls *in the Night.*

If your Ground-Tackle ſhould fail in the Night, riding at the *North-Foreland*, as very often hath happened, and you cannot weather the *Foreland*, weather the *North-ſand-head*; if you can but ſee the *North-Foreland*-Light, when that Light-houſe bears N. W. or North-weſt by North, then bear over into 8 or 9 Fathom, and being in that Depth, (ſteering to the Southward S.S.W.) you may be ſure it will carry you directly through with the *Brake*; but keeping your Lead carefully, and borrowing no nearer the *Brake* than 5 Fathom, nor going without 9 Fathom, or 9 and a half, as you have the Tide under you, and this Courſe will lead you through without danger.

Directions for the North end of the Goodwin, *for ſuch as ſail from the* North-Foreland *to the Southward in the Night.*

If you be at the *North-Foreland*, bound for the *Downs*, and that the Tides do fall out too early or too late to turn into the *Downs*, with the Wind at S. W. or S. S. W. take the following Directions.

If it be in the Morning before Day, then be ſure to weigh Anchor in convenient Time, to be at the *North-ſand-head* at the turning of the Tide to the Southward. From the *Foreland* you may ſteer out with a flood-Tide, S. E. by E. and S. E. or keep the Light of the *North-Foreland* N. W. by N. this Courſe will lead you out: But for the more certainty, be ſure to keep the Lead well, and then you may borrow off and on with the aforeſaid Winds, in 7 or 8 Fathom, and ſteering out in the aforeſaid Courſe, you ſhall find the Depth ſuddenly change to 15 or 20 Fathom; then you may hale up cloſe to the Southward along the back of the *Goodwin*, the Eaſtermoſt ſide of which lies S. S. W. and N. N. E. 12 or 14 Fathom, and is not above a Saker-ſhot from the Sand; but if it be in the day time, and the Wind blows ſo hard that you cannot well tack to turn through the *Gulls*, then the Marks to carry you out at the *North-ſand-head*, is the flat Church upon the *Foreland*, called St. *Peters*, a Ships length to the Northwards of *Broad-ſtairs* Peer-head; or borrow upon the Sand by the Lead as aforeſaid, and ſo taking the firſt of the Tide without the Sand, you may ſtand to the South-eaſtwards, till the *South-Foreland* bears Weſt by South; then caſt about and you ſhall weather the *South-ſand-head*, and be in the *Downs*-Road before any other Ship that parted with you at the *Foreland*.

Not being willing to enlarge this Book to a greater Volume, whereby the Price ſhould be augmented, I ſhall here conclude, referring thoſe that deſire farther Inſtructions for Piloting a Ship into any other Harbors on the Coaſt of *England*, *Scotland*, *France*, *Ireland*, *Holland*, &c. to the *Coaſting-Pilot*, ſet forth by *J. Seller*; or the *Safeguard of Sailers*, and *Pilots Sea-Merror*, Books containing good Directions, and uſeful Sea-Charts, ſold by *W. Fiſher*.

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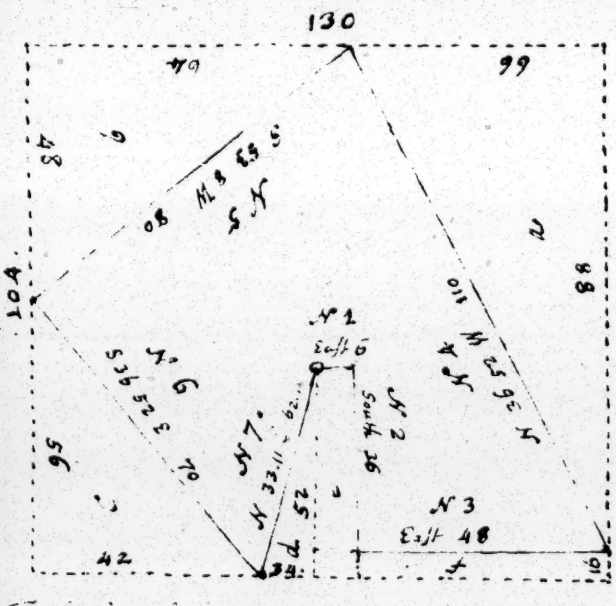

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